May, 1921 25 Cents

The WIRELESS AGE

Volume 8 Number 8

Boys of the Chicago High School Radio Association receiving a message from the Tilden School at Lane Technical School

Convention Number

Full Details of the Record-Breaking Second District Radio Convention and Exhibition

And Many Exclusive Features in This Issue

WORLD'S ONLY MAKER

Moulded High Frequency High Tension Insulators

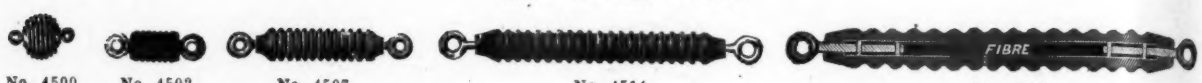
INSULATORS 1,000 TO 1,000,000 VOLTS

Medal and Diploma received at World's Columbian Exposition, Chicago, 1893.

TRADE ELECTROSE MARK

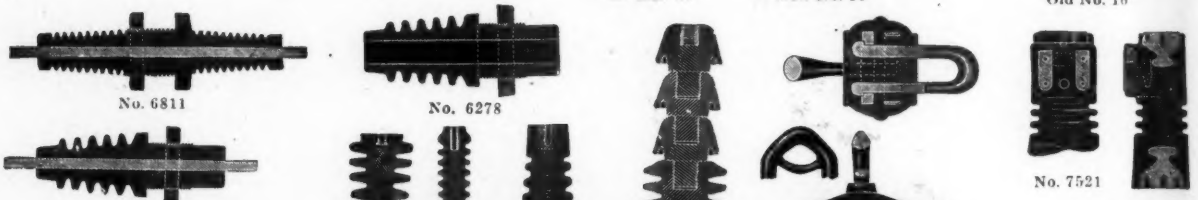
INSULATION
"MADE IN AMERICA"
Louis Steinberger's Patents

Medal and Diploma received at World's Fair, St. Louis, 1904



No. 4500 No. 4502 No. 4507 No. 4514 No. 4518

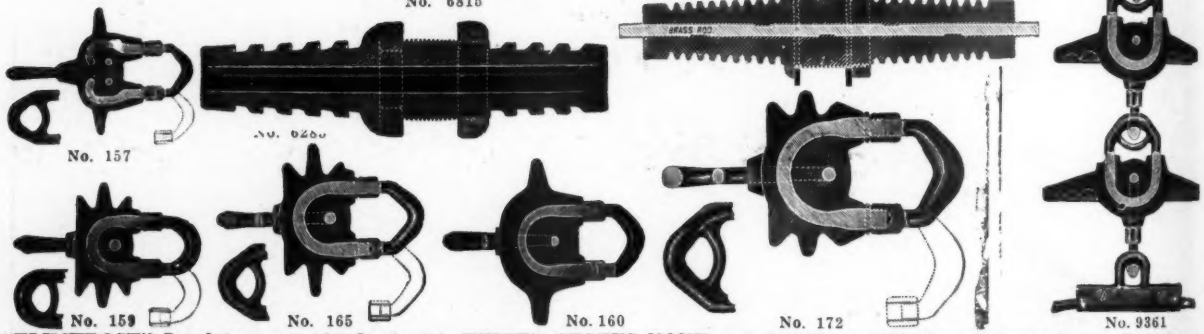
No. 2 No. 1 No. 7 No. 14 New No. 10 Old No. 10



No. 6811 No. 6278 No. 7521

No. 6848 No. 7302 No. 7518 No. 7537 No. 7370 No. 9302-A

No. 6222 No. 6815



No. 157 No. 159 No. 165 No. 160 No. 172 No. 9361

"ELECTROSE" Insulators are standard with UNITED STATES NAVY and ARMY and Wireless Telegraph and Telephone Companies "Electrose" is made in a number of grades for various requirements, each grade possessing special characteristics. "Electrose" Insulators—Best in the World for High Frequency Currents, Power and Transmission Circuits.

ELECTROSE STANDARD PRODUCTS

"Arcover" disk strain and suspension line insulators, **"Safety Strain"** Insulators, Disk, Hood, Thimble and Rod type strain insulators, Spool and Bracket-Arm strain insulators, Pin-type line insulators, Insulator pins, Roof, Barrier and Wall Bushings and Insulated Connectors, single and multi-part, plain and locking, water and gas tight, Bus-bar insulators, Insulating Supports and Pedestal, Arc Lamp Insulators, Insulating Knobs and Handles, Insulating Sheets, Tubes and Rods, etc., etc.

Electrose Railway Line Material:—"Safety Strain" Insulators, Brooklyn Strain Insulators, Insulated Turn-Buckles, Caps and Cones, "Ideal" Locking Caps and Cones, Insulated Bolts, Feed Wire Insulators, Third Rail Insulators, also special forms of Trolley Wire Suspension Insulators, etc., etc. Complete line always carried in stock.

Ignition Insulating Parts:—Distributor Blocks, Disks, Switch Bases, Spools, Brush Holders, Knobs, Handles, etc., etc.

"Electrose" insulation (certain grades) is recognized as the best obtainable for use in connection with insulating parts for ignition service for Automobiles, Aeroplanes, Motor Boats, etc.

Insulators and Insulating parts and devices of special sizes and forms, designed and made to order.

SOLE MANUFACTURERS

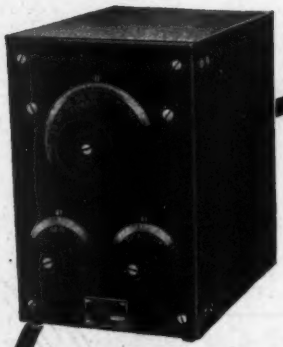
ELECTROSE MFG. CO.

60-82 Washington Street
66-76 Front Street
27-37 York Street
1-23 Flint Street

BROOKLYN, N. Y., AMERICA

Westinghouse

Radio Receiving Equipment



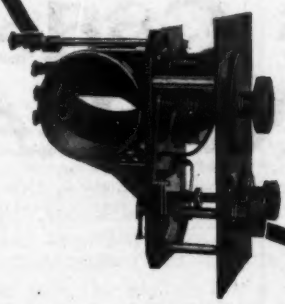
Type RA Short Wave Tuner, Style 307189, 180-700 Meters

Type DA Detector Amplifier, Style 307190, 2-stage, 3 tubes, Audio Frequency

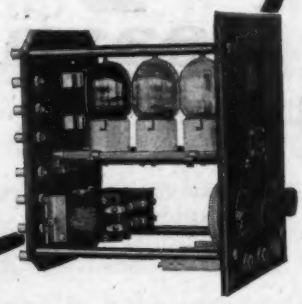
THIS high-grade Westinghouse regenerative tuner, and tube detector-amplifier embody the last ideas of two noted radio engineers, Edwin H. Armstrong and Frank Conrad.

This apparatus provides a most efficient set for telegraph and telephone reception over the amateur and normal ship wave length ranges.

Simple in Design, Easy to Operate, Single-Tuning Circuit, Highly Efficient.



Interior View of RA Short-Wave Tuner



Interior View of DA Detector-Amplifier

Our Radio Folder No. 4446 will interest you

Ask Your Dealer for a Copy

Westinghouse Electric & Manufacturing Company

East Pittsburgh, Pa.

Westinghouse

Vol. 8 Contents of **The Wireless Age** for May 1921 No. 8

Edited by J. ANDREW WHITE

FEATURE ARTICLE	Page
New York Amateurs Put It Over ..	9
WORLD WIDE WIRELESS	7
EXPERIMENTERS' WORLD	
A Commutator, Interrupter and Synchronous Gap, by George E. Hild (1st Prize)	22
A Turbine Type of Mechanical Interrupter, by E. Molyneux (2nd Prize)	23
A Mechanical Interrupter (3rd Prize)	24
Simple Capacity and Resistance Units, by R. U. Clark, 3rd	25
Amateur Trans-Continental Spark Reception, by Leo E. W. Kirby and R. H. Butler	26
Measuring Losses of Transformer, by L. R. Felder	28
N. A. W. A. Bulletin	31
QUERIES ANSWERED	32

ADVERTISEMENTS

MISCELLANEOUS	
Metal Arts Co.	28
Omnigraph Mfg. Co.	2
Fischer-Sweeny Bronze Co.	47
BOOKS	
McGraw-Hill Book Co., Inc.	39
Q.S.T., American Radio Relay League	35
Wireless Press, Inc.	4
ELECTRICAL EQUIPMENT	
Acme Apparatus Co.	28
American Electro Technical Appliance Co.	42
American Eveready Works	31
American Radio and Research Corporation	43
Atlantic Radio Co., The	40
Atlantic Radio Supplies Co.	5
Brandes, C.	38
Bunnell & Co., J. H.	28
Chambers & Co., F. B.	30
Clapp-Eastham Co.	42
Continental Fibre Co., The, Third Cover	
Continental Radio and Electric Co. Fourth Cover	
Corwin & Co., A. H.	44
Diamond State Fibre Co.	42
Doolittle Co., F. M.	44
Doubleday-Hill Electric Co.	34
Economy Radio Supplies Co.	43
Electrose Mfg. Co., ...Second Cover	
Federal Telegraph & Telephone Co.	46
Firth & Co., John	46
France Mfg. Co., The	34
General Radio Company	27
General Apparatus Co.	32
Grebe & Co., A. H.	45
Independent Radio Supply Co., ...	38
Johnston, Chas. H.	43
Jones Radio Co., The	45
Magnavox Co., The	33
Manhattan Electrical Supply Co. ..	41
Midwest Radio Co., The	30
Mignon System Mfg. Co.	36
Mutual Purchasers Association	41
Newman-Stern Co., The	35
Novo Manufacturing Co.	35
Pacent Electric Co.	32-36
Pitts Co., F. D.	37
Precision Equipment Co.	39
Radio Corporation of America ...	41-42
Radio Distributing Co.	6
Radio Electric Co., The	34
Radioelectric Shop	44
Remler Radio Mfg. Company	44
Somerville Radio Corporation	28-29
Superadio Corporation	3
Thordarson Electric Mfg. Co.	42
Tuska, The C. D.	43
Tresco	36
Vitalis Himmer Mfg. Co.	30
Western Radio Electric Company ..	43
Westinghouse Electric & Mfg. Co. ..	1
Weston Electric Instrument Co. ...	5
Whitall Electric Co.	30
INSTRUCTION	
Dodge's Institute	44
East Side Y. M. C. A.	45
Eastern Radio Institute	33
New York Wireless Institute	33
Radio Institute of America	29-47
Utimark's Nautical Academy	27
Y. M. C. A. Radio School	27
SMALL ADS OF BIG INTEREST ..	43

RENEWALS—When subscription expires you will find a renewal blank enclosed Return with remittance promptly.

CHANGE OF ADDRESS—Notify us of any change in your address, giving both the old and new location.

Published Monthly at

326 Broadway, New York

GREAT BRITAIN, 12-13 Henrietta St., London

AUSTRALIA, 97 Clarence St., Sydney, N. S. W.

Yearly Subscriptions in U. S., $2.50

Outside U. S., $3.00; Single Copies, 25 cents

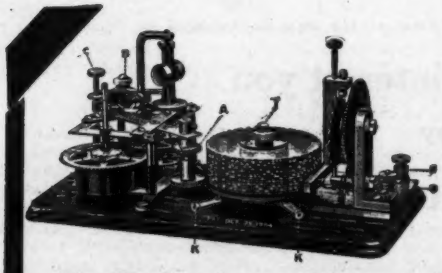
Entered as second class matter Oct. 9, 1913. Post Office at New York, N. Y., under the Act of March 3,1879. Copyright, 1921, Wireless Press, Inc.

Edward J. Nally, Pres. J. Andrew White, Vice-Pres. L. MacConnach, Sec'y. George S. De Sousa, Treas. J. D. Conmee, Business Mgr.

Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signaling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

Learn The Code With The OMNIGRAPH

The **Omnigraph** Automatic Transmitter will teach you the Code—at home—in the shortest possible time and at the least possible expense. Connected with Buzzer or Buzzer and Phone, the **Omnigraph** will send you unlimited Continental messages, by the hour, at any speed you desire. It will bring an expert Operator—right into your home—and will quickly qualify you to pass the examination for a first grade license.



4341 Richardson Ave.
New York City.
Jan. 21, 1920.

THE OMNIGRAPH MFG. CO.
Cortlandt Street, New York.

Gentlemen:—I wish briefly to commend your very excellent Automatic Transmitter. Recently I was successful in obtaining a first-class Commercial Radio License and I believe that the Omnigraph was my principal aid.

I took a four weeks course at a Resident Radio School in Theory only. I relied on the Omnigraph to get my Code to the proper speed, and the Omnigraph did it.

I was one of two in a class of eighteen to obtain a first-class License. The stumbling block for the others was CODE . . . . And I know that a short time receiving Omnigraph messages daily would have enabled them to pass the examination as easily as I did.

I believe the Omnigraph to be the easiest, quickest and cheapest method to learn the International Morse Code.

Cordially yours,
(Signed) GEO. E. SELLERS

The **Omnigraph** is used by several departments of the U. S. Government and by a large number of the leading Universities, Colleges, Technical and Telegraph Schools throughout the U. S. and Canada.

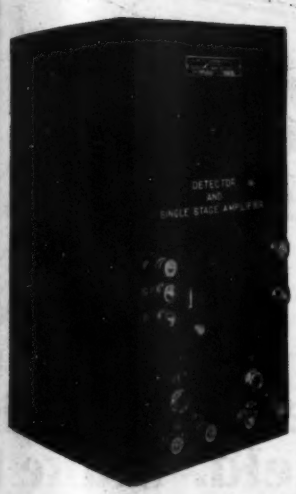
The **Omnigraph** is also used by the Bureau of Navigation in testing applicants applying for a Radio License.

Thousands have learned both the Morse and Wireless Codes with the **Omnigraph**.

Send for free catalog describing three models—$14. to $30. Do it to-day. The **Omnigraph** is sold under the strongest of guarantees—if not as represented, your money back for the asking.

THE OMNIGRAPH MFG. CO., Dept. C. 26 Cortlandt St., N. Y.

SUPERADIO

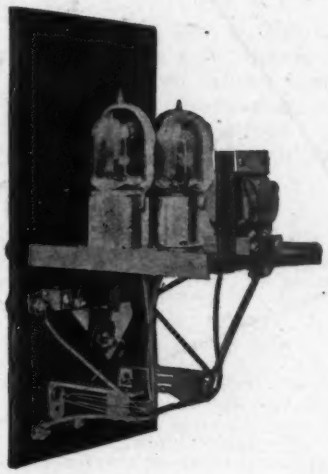


This mark of distinction on all our apparatus is the symbol of SUPREMACY.

Type D A-1, the BEST Detector and Single Stage Amplifier in the WORLD, with the new Filament Temperature Indicator, price

$45.00

Write for Bulletin 101



Superadio Corporation

Dept. D. 2674 Bailey Ave., New York

...e Sound-Method for Memorizing the Code

For success in telegraphing the letters must be learned by their *sound*.

Each letter has a distinctive cadence or rhythm which is easily memorized by a few hours' practice.

Charts which show the telegraph alphabet in dots and dashes greatly handicap the beginner. A mental picture of the dots and dashes of each letter forms in the mind, and when a signal is heard, the beginner naturally tries to call up the *picture* of the letter. In practical telegraphy there is not time to do this, and the next signal is lost.

The charts attached give the key to the rhythm of each letter of the telegraph alphabets. It forms no picture in the student mind but, instead, a sound is memorized, like a bar of music.

The chart is particularly valuable in learning to receive which is many times more difficult than learning to send. An hour a day devoted to memorizing the distinctive *rhythm* of each letter will enable the student to send or receive a message in a few weeks.

The beginner is strongly advised not to practice with charts or books which show the actual dots and dashes. Once a *picture* of each letter is formed in memory it will be found difficult to send or receive in the telegraph alphabet properly—by *sound*.

WIRELESS PRESS, INC.
326-28 Broadway, New York

Copyright, 1921, Wireless Press, Inc., N. Y.

THIS NEW WAY OF LEARNING THE CODE

is the easiest, quickest and most thorough ever devised for learning without instruments

If you want to learn the code—

If you want to "cinch" the signals you can't remember easily—

If you want to help some one else learn the code—

GET ONE OF THESE CARDS.

Don't try to teach the Ears through the Eyes

This system teaches the signals as they come through the Head Phones

Contain both Continental and American Morse—Printed on Celluloid Fit Your Pocket.

Price 50c

WIRELESS PRESS, Inc., 326-28 B'dway, N. Y.

Become a leader in this field. Make it your life work

--the big rewards are yet to be won.

Wake up—Radio is in its infancy. Intensive study — steady effort — absorbing interest— these will put you high in the ranks. And these books were written by experts to help you.

PRACTICAL WIRELESS TELEGRAPHY By Elmer E. Bucher

PRACTICAL WIRELESS TELEGRAPHY is the recognized standard wireless text book. It is the first wireless text book to treat each topic separately and completely, furnishing a progressive study from first principles to expert practice. Starting with elementary data, it progresses, chapter by chapter, over the entire field of wireless—fundamentals, construction and practical operation.

352 pages, 340 illustrations, handsomely bound in full cloth. Price $2.25

VACUUM TUBES IN WIRELESS COMMUNICATION, By E. E. Bucher

The only book published that comprehensively covers the theory and design of amateur wireless transmitters and receivers. Construction of transformers, high voltage condensers, spark gaps, aerials, masts, receiving sets for long and short wave length reception are described in great detail. Construction and operation of regenerative receivers, cascade amplifiers, preferred circuits for long and short wave receivers, direction finders, underground aerials and the use of Weagant's static eliminator for amateurs—all these are covered.

Cloth bound. 340 pages. Fully illustrated. Price $2.25

VACUUM TUBES IN WIRELESS COMMUNICATION, By E. E. Bucher

An elementary text book for students, operators, experimenters and engineers. Tells in understandable language the fundamental operating principle of the vacuum tube. Shows over 100 different circuits for the practical use of the Vacuum Tube as a Detector, Radio or Audio Frequency Amplifier, Regenerative Receiver, Beat Receiver and Generator of Radio Frequency Currents.

Cloth. 184 pages, 130 diagrams and illustrations. Price $2.25

RADIO TELEPHONY By Alfred N. Goldsmith, Ph. D.

It is the only book treating the subject of Radio Telephony in all its aspects.

This complete text on radio telephony is intended for radio engineers, operators and experimenters, also radio electricians in the Navy, men in the Signal Corps, and especially men in the Aviation Service who handle radio equipments. Presupposes very little knowledge of radio. Fully illustrated with wiring diagrams and previously unpublished photographs of "wireless telephone" apparatus.

256 pages, 226 illustrations. Full cloth. Price $2.50

WIRELESS TELEGRAPHY AND TELEPHONY—First Principles, Present Practice, and Testing, By H. M. Dowsett, M.I.E.E.

A new book intended to fit in between the elementary text book of the beginner and the highly specialized treatise of the advanced engineer and experimenter.

Cloth, 323 pages. Fully illustrated. Price $3.50

TELEPHONY WITHOUT WIRES By Philip R. Coursey

Following a brief treatment of the early attempts at telephony by electro-magnetic waves, the volume takes up the various problems of speech transmission, describes advanced forms of spark and continuous wave production, arc generators and vacuum tubes as producers of oscillations, alternators and the various forms of frequency raisers and gives a broad discussion of the modulation of the transmitted energy. Receiving apparatus and amplifiers are also discussed, together with descriptions of the methods and operation of apparatus and circuits designed for interference prevention.

Cloth, 396 pages. Fully illustrated. Price $5.00

AND DON'T FORGET TO INCLUDE A YEAR'S SUBSCRIPTION TO THE WIRELESS AGE WITH YOUR ORDER. REGULAR PRICE, $2.50 A YEAR. WITH BOOK ORDER, ONLY $2.00. (POSTAGE OUTSIDE U. S. 50c EXTRA.)

WIRELESS PRESS Inc., 326-28 BROADWAY NEW YORK

PRACTICAL AMATEUR WIRELESS STATIONS

An "Experience" Book

Containing the best suggestions of thirty-three experimenters on Building, Installing and Operating Experimental Stations for Radio Communication. Compiled by J. Andrew White, Editor, "The Wireless Age."

Paper 6x9 in. 136 pages. Profusely illustrated. Price 75c

HOW TO PASS U. S. GOV'T WIRELESS EXAMINATIONS By E. E. Bucher

New edition revised and extended. 142 questions and answers. An ideal review quiz book when used with PRACTICAL WIRELESS TELEGRAPHY. 75c

Size 6½x9¾ inches. Fully illustrated. Price 75c

HOW TO CONDUCT A RADIO CLUB By E. E. Bucher

Covers parliamentary procedure, indoor and outdoor experiments, 5,000-mile receiving sets, vacuum tube amplifiers and detectors and many other subjects.

Paper Cover, 148 pages. Fully illustrated. Price 75c

OPPORTUNITY COUPON

Wireless Press, Inc.
326-28 Broadway,
New York.

Date .....

Please send me at once the books checked below. I enclose $.....

- ..... Practical Wireless Telegraphy .....
- ..... Wireless Experimenters' Manual .....
- ..... Vacuum Tubes in Wireless Communication .....
- ..... Radio Telephony .....
- ..... Wireless Telegraphy and Telephony .....
- ..... Telephony Without Wires .....
- ..... Thermionic Valve, J. A. Fleming .....
- ..... Oscillation Valve, R. D. Bangay .....
- ..... Practical Amateur Wireless Stations .....
- ..... How to Pass U. S. Gov't Wireless Examinations .....
- ..... How to Conduct a Radio Club .....
- ..... *Wireless Age (with book order) .....
- ..... *Wireless Age (without book order) .....

*Outside U. S. 50c Extra.

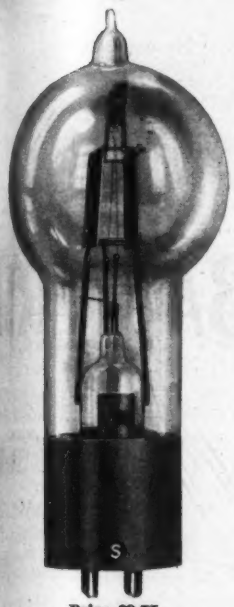
Name .....

Street .....

City ..... State .....

A-P leads again

NEW RECTIFIER TUBE FOR EXPERIMENTAL CW



Price $9.75

Come on, you CW enthusiasts! It's for you—a brand new rectifier tube for your experimental CW, which **makes the expensive high voltage DC** Generator unnecessary. Simply step up your 110 V A-C lighting supply with a small transformer to 350, 500, or 750 volts, and two of the new tubes do the rest, rectifying both halves of the cycle so the plates of your transmitting tubes get all the high potential direct current necessary—**without the use of a high voltage generator.**

The A-P Rectifier has a 75 milliampere carrying capacity, which is sufficient to operate five A-P Transmitting Tubes in parallel. For high power CW transmission, use additional A-P Rectifier Tubes in parallel.

A-P Rectifiers used in Type O A-C De-Forest Radiophones, equipped with the SHAW standard condensite four-prong base, and licensed under SHAW patents. Price $9.75. Order from your dealer or direct from addresses below.

Diagram of Connections Furnished Free With Each Tube

And for the best book on Radio, ask your dealer for "ELEMENTS OF RADIOTELEGRAPHY" by Lieut. Stone, U. S. N.; or order direct from

ATLANTIC RADIO SUPPLIES CO.
8 KIRK PLACE, NEWARK, NEW JERSEY

PACIFIC RADIO SUPPLIES CO.
638 MISSION ST., SAN FRANCISCO, CAL.

Distributors for Moorhead Laboratories, Inc., Manufacturers of

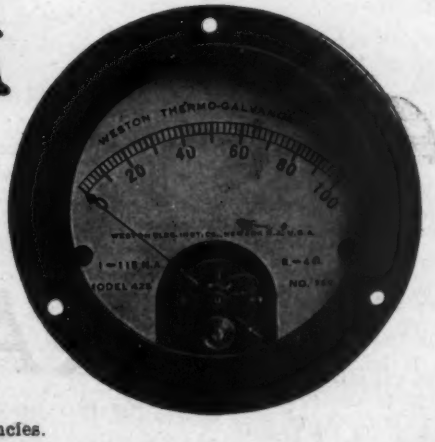
The New A-P Rectifier Tube

Thermo-Ammeters, Milliammeters, Current-Squared Meters For Radio Service

Weston

Model 425 Instruments

(3¼ inches flange diameter) are particularly adapted for use on small-size Radio panels where space is an important factor. Unaffected by temperature changes; 50% safe overload capacity; low in power consumption.



For use on Audio and Radio frequencies.

The Current-Squared Meter is ideal for use on wave meters and wherever decrement measurements are to be made.

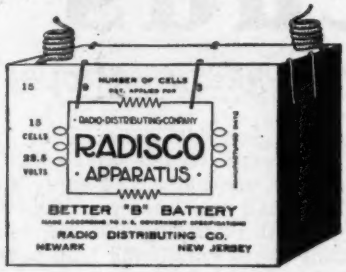
Write for information.

WESTON ELECTRICAL INSTRUMENT COMPANY

27 Weston Ave., Newark, N. J.

And in Principal Cities Throughout the World

No batteries at the price are as good



No batteries at any price are better

RADISCO BETTER "B" BATTERIE

ARE

powerful sturdy long-lived

Two pages of superlatives couldn't promise more.

Since the *still better* Radisco Better "B" Batteries have been at the service of the radio fraternity, amateurs as well as commercial operators, have endorsed them highly, by personal recommendation and by continued use.

Your Radisco dealer has a plentiful supply of these powerful batteries. His name, added to the Radisco trade mark is your guarantee of complete satisfaction.

Operating life, 600 to 1000 hours. 15 cells. 22½v.

No. 1 (3¼"x2"x2½") $1.50
Shipping weight 2 pounds

No. 2 (6½"x4"x3") 2.65
Shipping weight 5 pounds.

Larger size has Variable Voltage feature. Tapped in groups of three cells. *Ask your dealer to explain it.*

Use Radisco Better "B" Batteries for C. W. work: A radio phone operating on Radisco batteries is exceptionally quiet, and free from the disagreeable hum of a motor generator, or the rectified 60 cycle tone.

RADISCO

RADIO DISTRIBUTING COMPANY, NEWARK, N. J.

This mark RADISCO APPARATUS *your guarantee*

THESE DEALERS CARRY THE RADISCO LINE

ALBANY, N. Y.
Shotton Radio Mfg. Co.
8 Market St.

ASHVILLE, N. C.
Hi-Grade Wireless Instrument Co.

ATLANTIC CITY, N. J.
Paramount Radio Supply
518 N. Connecticut Ave.

BEINVILLE, QUEBEC.
Canadian Radio Mfg. Co.

BOSTON, MASS.
Atlantic Radio Co.
88 Broad Street.

BROOKLYN, N. Y.
Kelly & Phillips,
312 Flatbush Ave.

CHICAGO, ILL.
Chicago Radio Labs.
1316 Carmen Ave.

EUREKA, ILL.
Klaus Radio Co.
Branch, Peoria, Ill.

KANSAS CITY, MO.
McCreary Radio Supply
4th and Delaware Sts.

LOS ANGELES, CALIF.
The Wireless Shop
511 W. Washington St.

MONTREAL, QUEBEC.
J. B. Miller
136 Vendome Ave.,
N. D. G.

TORONTO, ONTARIO.
The Vimy Supply Co.,
567 College Street.

NEW ORLEANS, LA.
Rose Radio Supply
604 Gravier St.

THESE DEALERS CA THE RADISCO LIN

NEW BRUNSWICK,
Geo. N. DeLaplaine
306 George St. and
and Magnolia Sts.

NEWARK, N. J.
A. H. Corwin & Co.
4 West Park St.

OMAHA, NEBRASK
O. B. Radio Supply
406 Brown Building

PHILADELPHIA, PE
Philadelphia School
Wireless Telegra
Broad and Cherry St

WICHITA, KAN.
The Cosradio Co.
1725 Fairmont Ave.

PROVIDENCE, R. I.
Rhode Island Elec.
Co.
45 Washington St.

PITTSBURGH, PENN
Radio Electric Co.
3807 Fifth Ave.

PORTLAND, ME.
Atlantic Radio Co.
15 Temple Street.

SEATTLE, WASH.
Northwest Radio Ser
609 Fourth Ave.

SCRANTON, PENN.
Shotton Radio Mfg.
P. O. Box 3
Branch, 8 Kingsbury
Jamestown, N. Y.

WASHINGTON, D.
Eastern Radio and
tric Co., 1405 Florida
N. W.

The name "Radisco" is your assurance of dependable performa

Vol. 8. No. 8. MAY, 1921

THE WIRELESS AGE

WORLD WIDE WIRELESS

Regulation of Government Wireless Systems

PLANS for control of the Government radio activities will be worked out by a special committee to be appointed by members of the Cabinet whose departments use the wireless or are concerned with the direction of it. At present there is much conflict between the Government departments over the matter, and since the war, when all the radio was under the supervision of the Navy Department, there has been no hard-and-fast set of rules in operation.

At present the Navy has its own radio and so has the War Department. On the other hand, the Commerce Department has charge of the issuance of licenses for commercial radio. The Post Office Department, which is ordinarily charged with the supervision of methods of communication, has nothing to do with radio, although in the war period it was in control of all the land telegraphs and also the ocean cables. It appears to the Cabinet members that the present situation is mixed and needs adjusting.

There are various technical questions involved, such as control of the wave lengths, day and night periods to be given over to the several departments for receiving and sending, and the co-operation of land telegraphs with the radio systems.

The committee will also probably consider the supervision of commercial radio activities. It will not be the intention to institute Government control such as was applied during the war, but regulations which systems would have to comply with in future in order to receive licenses.

New Wireless Autographic Machine

A MACHINE for recording autographically radio signals from great distances, constructed on a different principle from the cumbersome apparatus now in use, has been completed and was demonstrated by Dr. E. A. Eckhard and Dr. J. C. Karcher of the Bureau of Standards. They have placed it in the same circuit and recorded with the same pen the ticks of a chronometer and the naval observatory time signals from Annapolis.

A chronographic recording drum pushes the paper past the chronograph pen at a uniform rate of speed and the signals are recorded as humps of the line, short humps for dots and longer ones for dashes. By winding the actuating magnets in different directions, it is possible to record simultaneously the seconds of local time as furnished by a chronometer and compare them with standard wireless observatory time without the errors of "lag" of the instruments.

The machine was perfected in order to replace the present wire telegraphic ear recorded methods of making scientific time observations.

Radio Papers Disappear With Discharged Engineer

DR. WILLARD C. GREEN, a research engineer of Jersey City, was arrested in his room at the Hotel Deer Inn in Orange, N. J., by Detectives James Dinley and Henry Gautier of the Jersey City Police Department. A blue print and some metal bases, valued at $50,000 by the Radio Audion Company, found in his room, were seized by the detectives and brought back to Jersey City.

Dr. Green was discharged by the company and, according to Elman B. Meyers, the blueprint and bases, which were to be used in an invention being perfected by the company, disappeared about the same time Dr. Green left.

Miniature wireless 'phone and telegraph outfit which is now used on board ships in Germany

Wireless Fog Signals for New York Harbor

THREE wireless fog signals are being installed by the Department of Commerce for finding the entrance to New York Harbor. One will be on Fire Island Lightship for vessels coming from the east, one at Sea Girt for vessels from the south and the third on Ambrose Lightship at the entrance to the channel.

They will send out an automatic radio message continuously. The signals can be picked up by means of the radio compass, which will indicate the direction from which the signals are sent. By taking his bearings from different stations the master of a vessel can determine his exact position.

This system is the opposite of the former wireless range finding one, in that a navigator determines his own position instead of flashing a signal to shore and having radio operators notify him where he is. Moreover, a vessel will not have to wait to get its position. The sending apparatus can be operated by the regular light keepers, wireless operators not being required.

United Fruit Acquires Radiocorp Stock

EDWARD J. NALLY, president of the Radio Corporation of America, announces that the United Fruit Company has acquired a substantial minority interest in the Radio Corporation of America, and the United Fruit Company will be represented on the board by George S. Davis, who has been elected a director.

Golden Gate Pilots Use Radiophones

NO longer will transpacific liners have to dally in the fog outside the Golden Gate waiting for a port pilot to guide them into the harbor, for all of the pilot ships are to be equipped with wireless telephones.

As soon as a steamer sends a wireless for a pilot, the pilot sloop outside the heads is notified and a pilot is transferred to the liner to bring her through the Golden Gate.

The Duncan sisters giving a bit of vaudeville by radiophone

Marconi Has New Wireless Fog Device

DISCOVERY of a new wireless invention by which ships may be guided during dense fogs was announced in Liverpool by William Marconi at the annual British shipmasters' dinner.

This invention, he said, has not as yet been in operation anywhere, and is based on a principle by which electric waves may be directed in any definite direction like flashes from a lighthouse. He declared these waves would take the place of leading lights in thick weather, and would prevent collisions of vessels during fogs.

Radio Censorship Abolished

HEREAFTER no censorship whatever will be exercised by the naval radio service over press or other commercial messages transmitted by wireless to relieve cable congestion. This announcement was made after a Cabinet meeting by Acting Secretary of the Navy Roosevelt, who was invited to the meeting by President Harding.

Former Secretary of the Navy Daniels put into effect a limited censorship on messages sent by naval radio to apply only to despatches which might tend to create misunderstanding between the United States and other nations with which America is on friendly terms. His theory was that any such message transmitted by a Government might possibly be construed as having the approval of the United States Government.

Mr. Roosevelt's statement reversing the Daniels policy follows: "In the past the policy of the Navy Department embraced a limited censorship over certain messages transmitted by the naval radio. The Department feels that censorship is repugnant to the ideas and concepts of the American people, except in times of national emergency. It is furthermore felt that censorship even of a limited nature implies a departmental sponsorship for those messages which are permitted to be sent.

"On account of the above and in view of the fact that no national emergency exists at this time, the Department hereby removes all restrictions over the press and other commercial messages sent by the naval radio, and wishes it further understood that by doing this it disclaims all sponsorship for any messages thus sent."

Wireless Service Between U.S. and Japan Extended

IT is officially announced that wireless communication between Japan and America was extended to the whole of the United States with the inauguration of the high-power sending station at Hara-No-Machi, near Sendai.

Outgoing press messages will be accepted at 54 sen (under normal exchange values about 27 cents) to San Francisco and 60 sen to New York and Washington.

The wireless rate will represent a reduction of 16 sen (or about eight cents) on messages sent to New York over the cables at press rates.

Annual Report of Bell System Describes Use of Radiophone

A CONSIDERABLE part of the annual report of the American Telephone and Telegraph Company, just issued, is given to a description of progress made during the year in development and research, especially in the field of radio telephony As the year closed, it is stated, more than 2,500 research and development projects were in hand, all designed to improve service and facilities. In 1920 two experimental radio telephone stations were erected on the Atlantic Coast, one near Asbury Park and the other near Plymouth, and they have maintained communication with two experimentally equipped ships plying from Boston to South Atlantic coast ports.

Radio telephony is established, the report indicates. "It will play an important part in establishing telephone communication with otherwise inaccessible places, and will make it possible for aircraft in flight and ships at sea to connect with the wires of the bell system and thus hold conversation with any of its subscribers wherever located throughout the United States."

Development of wireless telephony for trans-oceanic use has progressed, it is added, since 1915, when such conversation was first made possible. As no means has been found of making submarine cables carry the voice for such distances, development work in this direction is continuing.

Inability to confine a wireless conversation, to the stations immediately concerned is a factor which has interfered with the general utility of the radio telephone. By a method which enables a message to be automatically enciphered at the sending end and deciphered automatically at the receiving end in the form of printed words, this has been in a measure overcome, the ciphered words becoming an unintelligible jumble of sounds to stations not especially equipped to receive and decipher them.

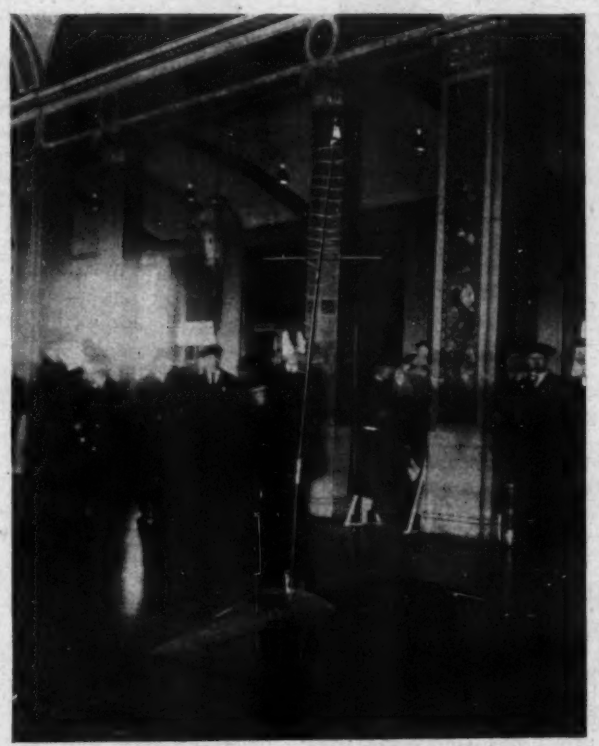
This method is declared to be readily applicable to use in the sending of press dispatches and the like. For purely conversational purposes a similar system of coding and decoding has been developed which makes the receiving end hear only intelligible words, while eavesdropping stations get only confused, unintelligible sounds. Development of this system, it is stated, is being continued.

New York Amateurs Put It Over

A Complete Description of the Exhibition and Convention of the Second District Executive Council Which Proved to Be a Record-Breaker in Every Way

THE combined convention-exhibition of the Executive Radio Council, composed of the amateur radio clubs of the Second Radio Inspection District, which was held at the Pennsylvania Hotel, New York, March 16th to 19th, inclusive, started off rationally and ended in a deluge.

The idea underlying the affair was to have a party of amateurs for amateurs; but the whole world came to it. The general result so far exceeded the wildest dreams of the council that it nearly drove the committee in charge of it wild before it was over. The whole thing was founded upon hope, financed on faith, and succeeded like John D. Rockefeller. The story of the convention is in reality a most striking example of doing the impossible; and of nothing.



The Glavin wireless controlled vehicle, or torpedo, which was demonstrated twice daily and proved to be a leading feature of universal interest

History records that back in January, when about seventeen amateurs of the Second District Executive Radio Council were seated around a table at the Seamen's Church Institute, New York City, talkin' and speakin' with one another, somebody, having nothing else to say, suggested that the Second District was due for a convention. (The members of the committee report that they haven't located that fellow yet, but they have hopes.) The argument was, that practically every other district had had a convention and listened to very learned discussions, various dissertations, schemes, plans and what-not, and the idea seemed to be that the amateurs of the Second District should show their good-fellowship and their willingness for self-sacrifice by enduring the same ordeal as amateurs of the other districts had recently been through.

Somehow, like vaccination, the idea didn't take. No great shouts of joy resounded, and the seventeen went back to sleep. Then it happened; just as things always do when everything is quiet and peaceful. Bang! came the explosion of the idea that has made echoes from the Arctic to the Gulf, and from London to Honolulu.

Someone got right up in meeting and told the now famous seventeen varieties of amateurs that they were a bunch of sleepers, dead ones, and the subject of ridicule by the amateurs of all the other radio districts of the country, including the illustrious Tenth. Here they were, in New York, the very heart of all the radio activity of the world, in close touch with all the latest dope, the latest developments and latest and most up-to-datest everything, and still they had never shown any sign of particular accomplishment or energy. The unidentified someone caustically remarked: "For heaven's sake, fellows, if the Second District is going to do anything let's get busy and do something different, something bigger, than has ever before been done in the history of amateur radio. Let's put the Second District on the map for all time. I suggest that we go uptown and hold a radio show and convention for more than a day or two and on a big scale. Let's go hire the Grand Central Palace for a week!"

Six amateurs who had fallen off their chairs in a faint had to be revived at this point.

When the meeting was able to regenerate itself and resume, it was suggested that a convention committee be appointed. It was. Inquiry as to financial resources then disclosed the fact that there was exactly $12.07 in the treasury with which this world-beating affair was to be financed!

Fond dreams of a week at the Palace were dissipated quickly, with considerable damping, so to speak. But in true amateur style, it was decided to attempt to put the thing over, at least for four days, and trust to luck and hard work to make it successful.

And so it came to pass that the thing that couldn't be done, was done, in due time on the Roof Garden and adjoining Butterfly Room of the Pennsylvania Hotel. It was an unquestioned success from the start; in fact one of the cold-feeters of the fraternity, who couldn't see anything to the attempt but failure, had to be rescued from being trampled on at the doorway the first night by the crowd entering the exhibition, interrupting his attempted assurances to the ticket taker as to what a failure it was.

To those who had seen the project from the start and had watched it grow as a result of their unselfish efforts day by day into the great big success it was, the words of the convention committee chairman, J. O. Smith, at the dinner on the 19th—"Well, fellows, we've put it over"—had a real significance. Every member of the Council can take justifiable pride in having had a part in an enterprise that any other group of men, or any other fraternity in the world, would have regarded as a hopeless impossibility. They had a right to feel satisfied for they had made their undertaking a smashing, big success, the biggest thing ever done in the history of amateur radio, and had done it on twelve dollars, plus seven cents . . . and faith.

Things began to happen even before the date of opening. On the night of the 15th, a few faithful ones were limping about the exhibition hall, wearied after two days and nights of real work whipping things into shape for the opening the next day, the hall resounded to the SOS of the Madawaska, which had just met in collision with the Invincible off the Jersey Coast. It came at a time when C. J. Goette (2JU), one of the convention committee, had been asked to help someone adjust a loud-speaker horn; and he sure did a regular job, for the first

thing that boomed out of it after Goette got it working, was the SOS of the Madawaska.

The newspapers got hold of the story of course, in some totally unknown manner, and in next morning's editions some millions of readers learned how a radio amateur on the roof of the Pennsylvania Hotel had saved a whole ship, its cargo and its passengers. There was but incidental mention of the fact that the Brooklyn Navy Yard and a number of other ship and shore stations had also helped.

At two in the afternoon of the 16th, the convention and exhibition was formally opened by Gen. Edgar Russel, talking over a radiophone from Fort Wood. The speech was reproduced by a loud-speaker horn at the Signal Corps booth in the hall, in such volume that it was feared several of the windows would be bent outward before it was over.

Then they came, and the attendance figures were up in the hundreds before the doors had been open more than an hour or two. At 3:30 p. m. the first meeting was held in the Convention Hall. The attendance was about 150. An afternoon gathering of schoolboys had been expected; but instead, there was an audience composed of a good percentage of men, even some grayheads. This same condition held all through the week. The percentage of grown people who attended the various sessions of the convention in every case so exceeded the younger element by a good margin, that one lone exhibitor had a kick. His grievance was that he sold small dingbats and whatnots to the younger element of radio, but that as their elders predominated at every session, he was disappointed in the volume of business. An analysis of the matter proved to the satisfaction of everybody interested that the youngsters were there in what seemed to be ordinary numbers, but the totally unexpected attendance of grown-ups completely overshadowed them. It did look as if the traditional office boy alibi had been requisitioned by more than one employer, who felt the necessity for burying his grandmother or his mother-in-law at least a couple of afternoons that week, in order to commune at first hand with his favorite hobby.

On the afternoon of the 16th, H. C. Gawler, of the Radio Corporation of America, delivered the afternoon's scientific lecture on all sorts of tubes, receiving and transmitting. After listening to Mr. Gawler for an afternoon everything was perfectly clear, whetting the appetite for the evening session in Convention Hall, when there were two very interesting speakers on the same interesting subject—tubes. "What Occurs in a Vacuum Tube," was made plain to everybody present by means of Bray Moving Pictures and the very able oral description of the various stages of operation by L. M. Clement, of the Western Electric Company. The movies proved an excellent method of visualizing the unseen and were an innovation of great interest to the audience of 400 present. By means of these ingenious movies, Mr. Clement clearly showed what happens in a tube when it is properly operated. One man in the audience was ovrheard to remark that he would like to see movies of what happens in the tubes of some of the amateur sets, where antenna currents of 5 amperes are reported from two 5-watt tubes.

The other part of the double bill was "Constant Current System of Modulation in Radio Telephony," by R. A. Heising, also of the Western Electric Company. Mr. Heising's presentation of this important phase of radio telephony is always interesting and instructive, but on this particular occasion, when he described the faults common to proper modulation in amateur radiophone sets, it was plain to be seen that most of those in the audience were so eager for every word, for every intonation of Mr. Heising's voice, that about half of the audience wasn't even breathing for fear of disturbing him.

The preliminaries of the world's championship speed code contest were supposed to be held immediately following the tube meeting in Convention Hall. It developed, however, that the motor used for driving the automatic transmitter had become so imbued, permeated and saturated with S P E E D, possibly because of anxious anticipation of its part in the important event, that it went clear crazy in the head and couldn't be coaxed to run at any rate less than 10,000,000 r.p.m. As none of the contestants present was willing to enter the preliminaries with a minimum rate of 176 words a minute confronting him, the trials were postponed until the following night.

At 10.30 p. m. the curtain was run down. The committee finally succeeded in getting the last radio enthusiast out of the hall by 12 o'clock, when they locked up the place, and called it a day. The first day's attendance figures totalled 914, so it looked as if it was going to be some affair before the week was over.

On the afternoon of Thursday, the 17th, the exhibition had struck its full stride and was going strong. Standing in the center of the hall the din of signals from a dozen loud speaker horns roared into one's ears. From one horn came the mosquito-like squeak-squeak of the familiar spark-coil, from others the raucous tones of an amateur "non-sink" rotary, the smooth tones of the familiar "sink" rotary, the piercing notes of the 500-cycle quenched, and the limpid, flute-like notes of the big fellows, whose signals are copied in far-distant strange lands. Occasionally, there mixed in the "Hello-hello" of a radio-phone, or that familiar and persistent call of "M O"—the station some amateurs have not as yet been able to locate. It was, beyond a doubt, the amateurs' paradise. Not only did they listen, but many of them went about with their mouths open to drink in this atmosphere direct from the promised land. They literally bathed in this nectar of the gods. It was their greatest desire come true—the amateurs' heaven itself, within 22 floors of the earth.

The Thursday afternoon meeting in Convention Hall was addressed by George J. Eltz, of the Manhattan Electrical Supply Company. About 200 amateurs attended the meeting and listened very attentively to what Mr. Eltz had to say about extracting unnecessary ohms of resistance from antenna and ground systems. The talk was on a subject of the greatest importance to amateurs, for many of them do not know and cannot consequently realize the connection between antenna resistance, antenna current, radiation and consequent range of a station. It had been the intention of Mr. Eltz to exhibit an amateur antenna and ground system of 4 ohms resistance as a specimen of perfection in amateur operation but, while he was able to locate quite a number of the order of 50 ohms resistance, he could not locate any of 4 ohms. If the amateurs profit by the facts brought out by Mr. Eltz—and he certainly made them plain enough—the order of things will undoubtedly be reversed by next year.

At the conclusion of the afternoon programme in Convention Hall, the visitors were thrilled by the sight of a torpedo on wheels wandering about the hall, but seemingly uncertain as to its destination. For a while it went straight ahead about its business, then veered off to one side, straightened out again and then suddenly changed its mind and swung entirely around and headed in the opposite direction. Everybody was mystified for a while, but Edward Glavin finally let the crowd in on the secret and demonstrated how easily the apparatus could be remotely controlled by radio. One woman visitor, who wore a wedding ring, watched operations for a time, and then suggested that it would be a good idea if she

Practically everything used in radio was represented in the booths in Exhibition Hall, and much of the exhibited equipment was in actual operation. Six interesting exhibits, typical of the whole affair, are shown above.

could attach the remote control principle to friend husband when he went out nights and forgot where he lived. Evidently Mr. Glavin's answer didn't satisfy her, for she went away with a disappointed look on her face. One business man wanted to know if Mr. Glavin could attach his remote radio control apparatus to a flock of traveling salesmen, then he'd be able to *make* those fellows go where he wanted. The radio controlled torpedo proved to be one of the most interesting features of the exhibition and demonstrations twice a day were watched intently by the large number of visitors, who loudly applauded every appearance of this latest scientific marvel.

The Thursday evening meeting in Convention Hall brought two favorite sons of the Second District to the lecture platform, E. H. Armstrong and P. F. Godley. Mr. Armstrong told of wonderful results obtained with the super-autodyne, high-frequency, amplifier. One statement which was particularly interesting to the amateurs was that with the system of high-frequency amplification

An enthusiast of the fair sex who visited the exhibition took the opportunity of learning how 2ZL's 100 watt set is operated, under the tutelage of H. C. Gawler

shown the number of amplifier tubes which it was possible to use could be 4-11-44-57, or infinite, for that matter. That worried the amateurs who attended the meeting, and for two reasons. One was, the great amount of signals which were in the air from China, Australia, Siberia, and other remote points which they could hear and read with 44 steps of radio frequency amplification—if they had it. The other great problem was the means of lighting the filaments of 44 tubes—when its a continual struggle to keep one or two filaments going seven days a week. The radio-amplifier, while highly desirable, seemed a little bit out of reach. It is rumored that Mr. Armstrong will come along some day and tell the amateurs how to run the filaments of a 44-step radio-frequency amplifier on A. C., thereby conferring an everlasting favor on the fraternity.

P. F. Godley's talk was a very interesting one on efficiency in operation of transmitting and receiving sets, particularly in the matter of short wave regeneration. It became apparent after listening to Mr. Godley that efficiency in receiving doesn't consist of merely hearing a signal. It's what you do with it after you get it, that counts. It was made clear also that with proper methods and apparatus signals can be pulled out of the air that were not there before; that is, those inaudible to an ordinary receiving set. Some remarkable examples of the regeneration and amplification of signals from distant points, in daylight, were cited.

The first preliminaries of the championship speed contest were started immediately at the conclusion of the Convention Hall programme. The first trials were conducted at a minimum speed of 35 words a minute, and gradually increased. About sixty candidates entered the trials and a large percentage of them fell by the wayside early in the game.

The following official message from President Warren G. Harding addressed to the Executive Radio Council, Pennsylvania Hotel, New York, came over the air from Arlington (NAA) at the end of the nightly time signals and weather reports:

"Greetings and good wishes to an organization that is in the forefront of progress, whose members have always been leaders of interest in the development of radio science, and whose services during the war and since have been of real public benefit."

The message was received on the equipment in the Navy Department's exhibit, in Exhibition Hall, by Chief Radio Gunner E. W. Dannals.

The attendance on the second day was 1017 and Exhibition Hall was well filled all evening.

On Friday, the 18th, the exhibition opened at 2 o'clock as usual and it was apparent early that the attendance was going to exceed either of the previous days.

The meeting in Convention Hall in the afternoon was addressed by Robert Gowan, of the DeForest Company, who gave a demonstration and talk on new C. W. transmitting and receiving equipment of that company.

Friday night was convention night and was given over to talks and discussion of amateur operating problems and conditions. The meeting was addressed by Chief Radio Inspector Arthur Batcheller, of the Second District, and Charles H. Stewart, Atlantic Division Manager, American Radio Relay League.

Mr. Batcheller spoke at length upon the relations of the Department of Commerce with the amateur, his remarks being of great value in acquainting the amateurs more closely with the provisions of the radio laws and regulations, and the amount of work which his office is called upon to handle, both amateur and commercial. He complimented the amateurs upon their general observance of the law and stated that in view of the great congestion of amateur stations in the Second District, that the very few cases where official action was necessary in the case of interference by amateurs, was remarkable. Mr. Batcheller impressed his hearers as being very earnest, but very human with a warm feeling of friendship for the amateurs, and it is a safe bet that many amateurs left the meeting with a quiet resolve to be better citizens, so far as radio was concerned.

Mr. Stewart gave a very interesting talk on the value of organization in amateur radio. He related how organization and common effort had built up a national relay organization of amateurs, that resembled, in its operation, that of our great railways. A message, like a train, started at one end, could be depended to go through to the other. His word-picture of what organized effort will accomplish was very interesting and was closely followed by those present.

The world's championship code speed finals were started at the close of the convention meeting, with the result that the world's record for accurate reception at high speed was broken by Mr. B. G. Seutter. This is fully described in another column.

The attendance on Friday was 1,519 and at times during the evening the floor of Exhibition Hall was crowded to capacity. Although the show was scheduled to close at 10:30 p. m., it was an hour later before the last visitor had left.

On Saturday afternoon the crowd at the door became so great before opening time that the corridors were filled and it was necessary to open a second ticket office.

The first thing on the programme was the jamming contest open to only bona-fide amateurs. This contest was won by N. Bernstein, Brooklyn, the best among about twenty-five contestants. The trials consisted of about 150 words transmitted by hand on a buzzer, fifteen contestants at a time endeavoring to copy the signals through interference created by other buzzers connected into the circuit and operated spasmodically. Regulation head telephones were used, connected in multiple to the buzzer circuit. Mr. Bernstein succeeded in making copy that was more nearly correct than any other contestant. He was accordingly awarded the prize of a Grebe detector and two-step amplifier set, donated by the A. H. Grebe Company.

The judges in the amateur home-made apparatus contest then gathered in the booth of The Radio Club, Irvington, N. J., and looked over many specimens of apparatus in three classes—spark transmitting, continuous-wave transmitting, and receiving. After long consideration and trial in actual operation the prize for the continuous wave set, based on workmanship, appearance and efficiency was awarded to Albert Bischoff (2AMF), of Newark, N. J., and he was accordingly awarded two 5-watt Radiotrons, the prize for this class of apparatus.

No award was made in the case of spark transmitting apparatus.

The prize for receiving apparatus was also awarded to Mr. Bischoff, after a competitive trial with a number of other sets, and he received a pair of Brown receiving telephones, donated by the Pacent Electric Company.

On Saturday afternoon the meeting in Convention Hall was addressed by K. B. Warner, Editor of Q. S. T., and Frank Conrad of the Westinghouse Company. Mr. Warner spoke enthusiastically of the possibilities and future of C. W. transmission, and showed a number of good circuits, with helpful suggestions for their operation. Mr. Conrad displayed and described the new receiving equipment which the Westinghouse Company is now building for the amateur market.

The dinner, which started at 6:30 and lasted till nearly midnight, is described elsewhere in this issue.

The attendance on Saturday was the largest of any day of the week, the total being 1,815. This made the total attendance for the four days 5,165. The attendance in detail for the four days was as follows:

	Paid Admissions	Exhibitions, passes and repeaters	Total
Wednesday, 16th ...	494	422	916
Thursday, 17th	667	448	1015
Friday, 18th	789	631	1520
Saturday, 19th	815	899	1714
Total for four days	2765	2390	5165

The executive Radio Council of the Second District, sponsors of the record-breaking show, is composed of two representatives from each of the following clubs:

Y. M. C. A. Radio Club, New York; Stuyvesant Radio Club, New York; The Radio Club, Irvington, New Jersey; Yonkers Radio Club, Yonkers, N. Y.; Radio Traffic Association, Brooklyn; Bloomfield Radio Club, Bloomfield, N. J.; Westfield Radio Club, Westfield, N. J.; Armour Villa Radio Club, Yonkers, N. Y.; Radio Club of the Bronx, Bronx, New York; Ridgewood Radio Club, Ridgewood, N. J. The total membership of these clubs is 428.

The Council was formed for the purpose of mutual benefit and general improvement in amateur operating conditions. During its short existence of a few months the Council has accomplished a great deal, has assisted a great many amateurs as a "big brother," and has always promoted the advancement of the science of amateur radio communication whenever possible. The clubs which compose the Council are the leading ones of the Second Radio Inspection District, which includes Southern New York, Long Island, Staten Island and Northern New Jersey.

The Exhibitors in Exhibition Hall were the following:

Acme Apparatus Company; Adams-Morgan Company; American Electro-Technical Appliance Company; American Radio Relay League; American Radio and Research

Instruction to all visitors was made a feature at the Radio Corporation's booth where radiotron's were used for both sending and receiving

Corporation; Burgess Battery Company; Chicago Radio Laboratories; Clapp-Eastham Company; Continental Radio and Electric Corporation; DeForest Radio Telephone and Telegraph Company; F. M. Doolittle Company; Experimenter Publishing Company; Federal Telephone and Telegraph Company; John Firth & Co.; A. H. Grebe & Co.; Insulate Paint Company; Manhattan Electrical Supply Company; W. J. Murdock Company; Pacent Electric Company; Lehigh Radio Company; Radio Corporation of America; Radio Distributing Company; Ship Owners' Radio Service, Inc.; Shotton Radio Manufacturing Company; Super Radio Laboratories; The Radio Club, Irvington, New Jersey; C. D. Tuska Company; United States Department of Commerce, Radio Service; United States Army, Signal Corps, Radio; United States Navy, Communication Service; Westchester Electric Appliance Co., Inc.; Westinghouse Electric and Manufacturing Company; Wireless Press; Y. M. C. A. Radio Schools.

The committee of the Executive Radio Council in charge of the convention and exhibition, was:

J. O. Smith, Chairman; A. H. Heim, J. Di Blasi, R. H. McMann, A. F. Clough, F. C. W. Thiede, C. G. Taber, E. W. Dannals, C. E. Pearce, J. N. Ferguson, C. J. Goette and Leroy Watkins.

That Banquet!

ADJECTIVES fail in any attempt to make a word picture of the banquet that closed the four-day session. It was far and away the most significant demonstration ever given of the deep and serious purpose, the strong unity of comradeship that binds the amateurs together. And the striking fact that remained in the minds of the spectators was that the banquet had not been intended to demonstrate anything. It was just a get-together feed, an informal gathering of co-workers who share a common ideal and purpose and who like to talk with, at and for each other.

The stately beauty of the Grand Ballroom of the Hotel Pennsylvania rather overwhelmed the 591 diners when they first found their seats. But before the service had progressed beyond the fish course, the banquet had become "a party"—with everybody singing the popular songs more or less harmoniously, but with plenty of spirit and a gusto that made the orchestra's efforts soundless. Those who had brought regenerative lungs with them occupied the periods intervening with whistling, in dots and dashes, the calls of old and new acquaintances and broadcasting various msgs. pertinent and impertinent, with answers that omitted nothing in their whistled return.

The greetings found a still higher pitch, however, when somebody announced a visitor from Hawaii and greetings to KEI brought a startling response in the form (and shape) of a Hawaiian maid of dusky hue who oscillated between the tables with little impedance from a garment mainly composed of a drapery of rushes and a few beads. Then when anxious wives and sweethearts had restored order among their dinner partners and were breathing easier ,a statuesque beauty appeared from nowhere in particular and sang a soothing song about something or somebody, and then did it all over, to another tune and with the aid of a violin. Following which came the song leader again, and everybody joined in a merry chorus of popular songs calculated to aid digestion through to the demi-tasse.

With the last sip, came the rap for order—badly needed—and the chairman, J. O. Smith (2ZL) opened up a dignified address of welcome with the classic phrase: "Well, fellows, we put it over!"

Bedlam again.

When the drum-fire of hand-clapping, roars of appreciation and general hilarity had subsided, we heard something to this effect:

"The Radio Amateurs of the Second Inspection District have attempted the biggest thing ever done in the history of amateur radio, and they have put it over.

"As to the financial end of it, there has never been any intention on the part of anyone to make any money out of it. All the Executive Council was interested in financially, was to break even. The whole thing was launched on blue sky and faith. It was made a successful undertaking by the whole-hearted co-operation of the individuals who attended the meeting and who dug down into their pockets and financed the initial stages of the undertaking by voluntary contributions.

"As to the great amount of good done by this Convention and Exhibition—no man can say. It is inestimable. For the first time in their lives many amateurs have actually seen and heard equipment of all kinds in operation that heretofore they have seen only on the printed page. They have had unlimited opportunity for asking questions (and the radio amateur at questioning is the champion of the world) and obtaining first-hand, valuable information from men who were able and willing to give it, and which has never before been available.

"Then there is the bigger side of the matter—the side which concerns not only this exhibition, this district, or this country, but the scheme of civilization of the world at large. And that is, to know your fellow-man. In ordinary life a stranger is viewed with indifference, intolerance or hostility; the same rule applies equally well to amateur operation or to the world at large. Once we know our fellow man, or our fellow amateur, these barriers of coldness and distrust disappear, and an interchange of ideas and information, of value to both sides, usually follows. It is a fact that this convention and exhibition has accomplished an untold amount of good in the way of a better understanding between all of us. And if we have accomplished the general result of advancing the great scheme of civilization to a higher plane, we have accomplished something of which we can all feel justly proud."

Mr. Smith then introduced the individual members of the Convention Committee, "to whom," he said, "the success of this convention is due." Generous applause was given each of the ten members as they rose in turn from their places at the tables.

H. C. Gawler, of the Commercial Department, Radio Corporation of America and former Chief Radio Inspector, First District, was then introduced. Mr. Gawler dwelt upon the problem in radio interference in the operation of amateur radio stations and said that one reason why he favored radio clubs, was that they kept the amateur out of war. "To overcome this difficulty," he said, "it is only necessary to start a radio club, and let it do the work. The club should have a means of obtaining information concerning the progress in radio from day to day, because radio certainly is making fast progress. Unless this information is obtained through the radio clubs, there will be difficulty.

"There is an easier way to do this, if in organizing a radio club you will take into consideration the fact that there are three classes of amateurs now, as against only one class before the war. There now is the junior class, intermediate class, and the ultra-amateur, in the C. W. class. If you make your club meetings interesting to the C. W. class, the little fellows are going to fall behind and be in the way, and they won't enjoy themselves at all. You will have to have a three-spirited organization, catering to the needs of the junior, the intermediate and then this ultra-amateur class.

"You should have selected groups in the clubs formed, with the object of holding meetings once a month for elementary and advanced discussions. Then call on the manufacturers of amateur radio equipment and ask them to send speakers to your meetings. You must have a plan; a progressive one; if you do not keep on, C. W. will run away from you."

F. H. Schnell, traffic manager, A. R. R. L., was next called upon. He said:

"This convention has been to me like a big dream, and I think I am dreaming yet. I have never seen anything like it in my life; I've never seen any place where so many amateurs have been gathered together. As I sat up in my booth for the last three days it has been like something going up and something going down. That something was your chairman, Mr. Smith, and Mr. McMann. One is an oscillator and one is a modulator. They did carry some!"

He then displayed a handsome silver loving cup, presented to the American Radio Relay League by Wynne Smith in the interest of "citizen wireless," stating that suggestions had been asked as to what it should be given for and for what period of time. He reported that 300 answers to this question had been received:

The big dinner that broke all records for attendance and enthusiasm. Practically everybody engaged or interested in radio in the eastern part of the United States was there or tried to get there. A large number of the fair sex added charm and beauty to the affair.

Speakers' table, left to right: K. B. Warner, Editor, Q. S. T.; F. H. Schnell, Traffic Manager, American Radio Relay League; H. C. Gawler, Commercial Department, Radio Corporation of America, formerly Radio Inspector, First District; H. P. Maxim, President, American Radio Relay League; J. O. Smith, Chairman Convention Committee; Arthur Batcheller, Chief Radio Inspector, Second District; Lieut.-Commander D. C. Patterson, D. C. S., Naval Communication Service; Lieut. Howard S. Paddock, S. C., U. S. Army; E. H. Armstrong, P. F. Godley and J. Andrew White, Editor Wireless Age. (Dr. A. N. Goldsmith, who arrived after the photograph was taken, occupied the vacant seat at the right of the chairman.)

"One of them says, 'Hook her to your bulb.' Another says, 'Fill it with electrons and give it to Paragon Paul.' Another says: 'Hold it until Grebe gaps or Baldwin phones.' The other 387 said: 'Fill it with something to drink and distribute it around the banquet hall.'"

Each suggestion was received enthusiastically, but decision was apparently reserved and the thirst of majority opinion went unrelieved, as Mr. Schnell concluded:

"To the members of the Second District Council I want to say that I wish to congratulate you on doing something that is the finest thing that was ever done for citizen wireless ,and if you are going to have another show, place me on top. If someone does not wake me I will still think this is a great big dream."

Chairman Smith then constituted himself a human directory and called, by name and call letters, for hundreds of individual amateurs to make their presence known by standing up and receiving the greeting of all the others present. When asked to respond geographically, it appeared that they came from all nine districts in the country. In some cases only a lone amateur arose, but in others several score bowed and blushed before the warmth of their reception. The eagle eye of Inspector Batcheller sharpened at the concluding call for the identification of "Tenth District" licensed(?) men. But, if there, they were hard of hearing.

The prize of a Paragon RA10 receiver for the largest attendance in the case of individual radio clubs was awarded to the Radio Traffic Association of Brooklyn, which had forty-four members present. The Radio Club of America and the Radio Club, Irvington, N. J., were tied for seconds honors, with twenty-eight representatives credited to each. More than thirty clubs were represented at the dinner including delegations from New Haven, Conn.; Troy, N. Y.; Worcester, Mass.; St. Louis, Mo.; New Philadelphia, Ohio; Philadelphia, Pa.; Stamford, Conn.; Buffalo, N. Y.; Hartford, Conn.; Boston, Ohio, and Pittsburg, Pa. About twenty-five local clubs were also represented. Individuals were present from six of the nine radio inspection districts, including one from the state of Texas.

When this interesting method of making each fellow's identity known to the other had run its course ,the chairman called upon Dr. Alfred N. Goldsmith, of the College of the City of New York and Institute of Radio Engineers. He illustrated the development of the radio disease by an anecdote, in substance as follows:

"I recall one of my good friends coming into the laboratory a great many years ago. He looked at the wireless apparatus and said, 'Why on earth are you interested in this thing?' I showed him what I was doing, and he was done for!

"He told me the first thing that happened to him was to practice code. That was the first stage of the disease. The next stage was when he turned all the street signs into code. He was nearly run over several times, and then he passed into the third stage, when he drank soda water to dots and dashes. He is headed straight for the continuous wave."

The amateur, in the opinion of this eminent authority, will be instrumental in bringing about the wonderful ideal which the great dreamer, Tesla, set forth years ago. "I look forward to the time," said Dr. Goldsmith, "when any man desiring to speak to his friend will take his telephone and speak from the height of the mountain to the valley below. The friend will give the answer; and if he hears no answer, he will know his friend is dead.

"There are two great possibilities for the amateur," he explained. "One is use of continuous waves, and the other is a recommendation for the extension of wave lengths. The recommendation is, to extend the wave length range, possibly from 180 to 250 meters. It happens that between 180 meters and 250 meters there are something like 46,000 cycles. If we use—as we well can—continuous wave sets, we can put practically 500 stations within that range of wave lengths, all working at once and all non-interfering. Furthermore, if instead of sending 1,000 cycle tone notes, people prefer to send at high speed, then all amateurs can send 600 words per minute. Radio telephony, continous waves, high speed, and high speed reception, mark a portion of the bright future for the amateur. So I certainly would like to suggest as the motto of the amateur: 'Continuously may he wave.'"

Chairman Smith then announced that the next speaker, J. Andrew White, Editor, THE WIRELESS AGE, would undoubtedly have some very important news for the amateurs. This evidently was an unexpected form of introduction, for the speaker's opening remark was to the effect that the expectation of an important disclosure had put him in the position of the negro who was about to be hung and said: "This certainly will teach me a good lesson."

Mr. White added that the chairman was probably referring to a recent trip to Washington.

"Something pleasant happened then. I had a very interesting talk with one of the best friends of the amateur—Admiral Bullard. I see no reason why I should not tell you just what he told me. There was no secrecy imposed on it, but what he said was entirely unofficial; he was speaking his real heart. It was the Admiral Bullard you all should know."

Mr. White explained he had remarked to the Admiral that perhaps the amateurs were a little bit worried about the policies of the new administration. To which the Admiral, with a twinkle in his eye, had replied: "So soon?"

The editor stated that he then asked: "Can you tell me how the Navy is going to feel about the amateurs with a new President in office?" and continued: "This, the Admiral said he could not tell me, but he added: 'I can tell you how the Director of Naval Communications is going to feel—just as he feels this morning. That is, I would be lacking in gratitude if I did not have a strong sense of obligation to these young men. The valuable services the amateur rendered during the world war has established for him a place in history!"

An outburst of applause greeted this acknowledgment by a government official that the services of the amateur in time of emergency had not been forgotten. The editor continued:

"Thus encouraged, I said: 'Admiral, there has not only been a disturbance, but no little controversy and some anxiety over the Poindexter Bill.' (Proving that I do read other people's magazines. THE WIRELESS AGE has not, and does not call for lots of protest every time new legislation is proposed. It will get to be an old story if we protest too often.) But as to Admiral Bullard's reply; he said: 'Nothing doing; the amateur must be protected. I told Senator Poindexter that I wanted to appear before the Senate Committee. And if the bill is again brought up, I will go, just as I proposed to do in the last session. I feel there should be no new limits put on amateur activity now.'

"That's the good news for you!" announced the speaker, and the diners let loose a demonstration of jubilation as it suddenly became clear that the Navy Department no longer would favor or foster restrictive legislation but in the future would aid the amateur in every way possible.

The speaker said that this co-operative attitude and generous spirit on the part of the Government insured a great future for amateurs. "But," he concluded, "one trouble is, we will talk about C. W. and we will talk over the other fellow's head. It is like learning skating; the hardest thing is the ice. We must break the ice,

for the newcomers, the beginners. A good many people attended this convention without knowing what it was all about. They know now. It's a start toward getting a lot of new material, many new stations.

"When we get that great public in, Dr. Goldsmith will have the problem of overcrowded ether solved. Mr. Godley is solving it now—on the table-cloth. And that's the amateur spirit. When that time comes I hope we editors will be able to present the solution to the public without mutilation."

It was then revealed that short-wave long distance working by the American amateurs had aroused the curiosity of co-workers overseas, for there suddenly appeared among the diners a canny Scotchman, plaids, tam, cane and all, who demanded in ribald tones information as to whether Mr. Hugh Robinson (2QR) of Keyport, N. J., was present. Quickly the rumor spread that it was one, Mr. G. Benzie, of Aberdeenshire, Scotland, who had come across the sea to give the once-over to the Keyport station from which radiophone messages were picked up last October.

The Scot received with a shriek of despair the chairman's assurance that Hugh Robinson was not in the room. Apparently, this was a great disappointment, for the visitor from overseas had a gift in the form of a potent liquid contained in a bottle, which he waved aloft as the orchestra broke into the strains of "I Love a Lassie," and weaved his way out of the room, singing:

I'm looking for friend Hugie,
Who's heard where the land is dewy,
'Cause we have caught his music and his call,
'Cross the ocean he is able
T' transmit without a cable;
He's got a system that beats them all.

Following the visitor's departure, the diners, with unampened enthusiasm, and thirsts, were recalled to domestic affairs by the introduction of H. P. Maxim, President American Radio Relay League, who opened his address with the statement that it had been his good fortune to address amateurs in most of the large cities from Portland, Maine, to San Francisco, California. "We had a convention where the colossal number of 118 people were present," he said, "and then it went up and up and up, and now we have a convention in the Second District and I am told there are present at the banquet tonight 600 people. I cannot help being very much impressed.

"I have seen amateur radio grow from a very little beginning," he continued, "and if I were to have told you three or four years ago that in March, 1921, you would have in one of the largest hotels in New York City, 600 amateurs seated down to dinner together, you would have said 'He is crazy.' I would not have dared to say it. "It makes us think what is all this coming to. Just think of the motive that brings us all here together! As I look around here and see the quality and spirit of the young men and middle-aged men, it is very inspiring. I am very proud indeed to have been identified with amateur radio and to see it grow.

"One of the things that impresses me is the fact that there are two great big things which you are doing. They are equally important. One of them is the advancement of the science of radio communication. You are doing perfectly wonderful things. You are advancing at a rate the world has never seen before. And there is another thing that is equally as great. You have demonstrated that a large number of people with a great many diversities of interest can co-operate. I cannot help thinking what a wonderful thing the amateurs of this country put across.

"Just think of sending a message from Hartford to Los Angeles and getting an answer back in six and one-half minutes. If I had come to you in the days of good old 2PM when we got a message over the coast and back in an hour and forty minutes, you would never have thought that in 1921 we could have done the same thing in six and one-half minutes."

Mr. Maxim described his sensations as he sat in his station and heard the message start across the country, remarking: "I suppose there were ten thousand of you good fellows who just itched to get at your key, but you did not do it. You co-operated and it meant success. If you keep this cooperation, the Lord only knows where it will take us!"

Arthur Batcheller, Chief Radio Inspector, Second District, was the next speaker. He said: "This evening has been a very entertaining one to me and it has been of considerable importance to the United States Government." He then illustrated the progress of amateur activities by statistics showing that after 1912, when the regulations were enforced, 1312 amateur stations were

General Edgar Russel, known to all A. E. F. Signal Corps men, caught by the camera while he was looking things over "like any other amateur"

licensed the first year, whereas on January 20, 1921, there were exactly 10,000 licensed amateur operators and stations—a record to be proud of!

He called attention to the fact that: "The United States is the only nation extending to its citizens the privilege of operating wireless telegraph transmitters and receivers; even in Great Britain they limit the receiving and transmitting. The liberality on the part of our Government and co-operation of the amateurs is responsible for the marked success of amateurs today."

The attitude of the Department of Commerce was wholly favorable to the amateur, he added, stating: "Two weeks ago, while I was in Washington, I had quite a talk with Commissioner Chamberlain and I found that he is very favorably impressed with the continuation of the amateur activities and has instructed us to aid amateurs in every way we can." Mr. Batcheller expressed regret that his office did not have the time or personnel to give the amateurs the attention they deserve. He said that since August of last year, there had been only nineteen complaints in the Second Radio District where amateurs had interfered with commercial traffic. "We have 1,600 licensed amateur operators in the Second Radio District," he explained, adding: "When any individual makes the remark that the amateurs are seriously interfering with commercial traffic today, it is not so, because

my office is the first place that the complaints are entered. Nineteen complaints in six months is a mighty fine record, and a record to be proud of.

"The only objection that we have at the present time is that a great many amateur wave lengths are in excess of 200 meters. It is not because we do not know that these wave lengths are being used, that they are not interfered with, but because of insufficient personnel to check up each individual amateur. I hope through the organizations and local clubs in this vicinity, that we will not need to regulate amateur transmission."

He concluded his remarks with expression of the opinion that the convention, he was sure, would go down in the history of the United States as one of the greatest accomplishments of amateur radio.

Lieut. Com. D. C. Patterson, D.C.S., of the Naval Communications Service, made the next address. He said:

"Before I speak of the Navy in its relation to the amateur, I would like to tell you just a little what we are doing around New York. You have all seen the torpedo which has been shown at the exhibition, controlled by radio. Over in the Navy Yard in Brooklyn are two of the former German war ships. By the terms of the treaty these ships must be sunk, but before they are going to be sunk by the guns of our Atlantic Fleet, they will be equipped with this same apparatus and taken out on the ocean and controlled as they are battered to pieces by our fleet.

"Admiral Bullard asked me to tell you that he regretted very much not to be able to be here," he continued, "but asked me to represent him. As you all know, radio communications are the eyes of the Navy and without them we could not fight. We might as well be blindfolded. It was in the summer of 1911 that the Navy first came in touch with the amateur, and at that time we started to issue licenses to those who were qualified. Ever since we have taken a personal interest in them all. We send out messages every night. Very soon we shall move to our new office in the Ferry Building in New York City, and make room for the amateurs so that they can come for instruction or information."

E. H. Armstrong, radio research engineer, who won fame through his development of the regenerative circuit while still in the amateur class, was then introduced by the chairman. He said, in part: "On an occasion like this, the mind unconsciously goes back over the events of past history. I must confess to a very serious attack of cold feet, because an occasion like this makes a man feel very old.

"It is not many years ago since I started in radio, but a tremendous amount of progress has been made in those years. About sixteen years ago I started in with a bunch of amateurs up in Yonkers to try and receive NAH station. We succeeded after a year of tests! We never hoped or expected to receive messages from Honolulu or Moscow, as is done by the amateurs of today.

"You will find a very curious thing in the history of the development of radio—that inventions in general come from the independent investigators, from the amateurs, and the amateur is absolutely the incarnation of the investigation. Let us look into the future. I do not believe there is any one here who has an imagination to go one year in advance of the art. My ambition is for a super-regenerative circuit. I predict that before you have another convention, within a year from tonight, someone will work this out and I will get my wish."

Lieut. Howard S. Paddock, of the Signal Corps, U. S. Army, the next speaker, said:

"I regret that General Russel was unable to be with you and address you in my place, but as representative of the Signal Corps, I wish to compliment you very highly upon the great success of the greatest radio convention which has ever been undertaken in this country. The success of this convention, however, was never in doubt. The spirit which has characterized amateur radio since the beginning of the art is one which will succeed anywhere. One example of this is the way in which the amateur radio men answered the call to the colors and made the service of communication of their country a great success."

He said that the success of the convention would insure closer cooperation between the Signal Corps and all amateur radio men. The Army is going to open a Signal Corps Laboratory Station at Fort Wood, Bedloes Island (New York Harbor), he explained, adding: "We have now low power apparatus, but would like to cooperate with the amateur in every way. If we can be of any assistance to any of the amateurs we are open to render that assistance at any time. The radio station will be open at all times to visitors. We are planning the installation of a 6-kilowatt remote controlled telephone set which undoubtedly will be of interest."

K. B. Warner, Editor, Q. S. T., was then called upon. He referred to the keynote sound by the previous speakers, stating: "I am certainly delighted at the various remarks that have been thrown in on the side of C. W. I say watch out for C. W., or it will run over you."

He felt that the amateurs had "made radio history. Your convention committee has done a very wonderful thing. We are all very proud of them. There is no district except the Second that could have put over the show in the style done here."

To illustrate the amateur's future possibilities, Mr. Warner told how a prominent New York amateur had recently recounted some of his experiences during the war where the radio control principle was applied to an airplane. "They got it down to a fine point where it worked out perfectly," he explained, "and then they called in all the naval officers for a demonstration. Secretary Daniels was standing alongside the operator watching the machine, expecting to see it turn to the right then to the left and to the right again. It flew on and on, until finally it was just a little speck in the sky. Then it disappeared altogether. Later, it was discovered that the antenna switch was open! That is how the amateurs of the Second District are going to go.

"The Second District Council in this convention has put itself on the map. It is now up to the amateurs in this territory to back it up, cooperate and give it every possible support. You amateurs are so congested here in the Second District that without co-operation you can not get the most out of wireless. Now that your council has so firmly established itself, I would suggest that the proper thing to do would be to appoint a committee and go to Mr. Glavin and get the thing he has. Start it and forget to open the switch, so it will keep on going forever!"

Paul F. Godley, radio engineer, was the concluding speaker. He remarked the inspiring presence of representatives of many government departments—all anxious to get on the band wagon, now that amateur radio had become a great success—but regretted an omission. "Mr. White," he said, "has just informed me that the Department of Commerce has a rival in radio, for the Department of Agriculture has just this evening reported a record crop of nuts!"

He added: "One thing which strikes me most forcibly is the similarity of this meeting to the old official Methodist revival. You have heard a lot this evening about C. W. Of course, that is something we all hope for. C. W. will do a great deal for us. In the meantime many of us will have to continue operation with our damped wave set. If there is anything I like to see it is a man who does a thorough job of a thing. The number of men in this room who have done a thorough job with their spark transmitters are very few."

He said that he had a message that he wanted each man to take home with him. "Has it ever occurred to you men, that possibly there is a man in the next house to you whom you could probably interest in amateur radio if you were unselfish enough to give the time? For the good of amateur radio are you going to be willing to be unselfish enough to interest that neighbor of yours in amateur radio? That, gentlemen, is a little part which each of you can play in this game of ours. We have progressed to the point, as I pointed out a moment ago, where all of these men can get on the band-wagon. There is no need of stopping there. Interest your neighbor! It will pay you, every one of you, and it will make for greater success in the continuance of this nation-wide method of communication.

"There is another thing; this too is about unselfishness. I presume every one of you, time and time again, have completely monopolized the ether. It is all right once in a while, but be reasonable. The interference problem is getting to be something that must be dealt with. I do not know of any easier way to deal with this problem, than for each and every one of you to take yourself in the closet and converse with yourself, and decide that first of all you are going to give the other fellow some consideration. Having done that, the QRM problem will have solved itself."

As Mr. Godley sat down, amid applause that enthusiastically seconded his plea for fair dealing, the orchestra broke forth into the solemn strains of the Dead March, the doors of the ballroom slowly opened and a weird procession entered. It was headed by a casket draped in funeral black supported by pallbearers appropriately costumed in begrimed overalls. With impressive gravity they set down their sad burden and a sour-visaged member of no apparent orthodox clergy in mournful tones declaimed:

"Dear Brethren and Sistern:

"As strange as it may sound to many of you, a radio amateur is a human being—though peculiar. He will put more energy into pushing a dinky "greetings-by-wireless" message through the evening jam than he will put into a whole day's work. He is immune to the sleeping sickness. He can get along with less sleep than any other of the human species. He works while the world sleeps. He makes radio a business; and business a recreation.

"When, however, in the course of an evening, the oscillations from the stations of two of these funny beings osculate, or come together violently in the ether—and the Lord knows *ether* should be administered to some of 'em—a general heating-up process occurs, and the hotter they get, the more they get tangled up. Finally they become so violent they lose all sense of the fitness of things and don't care what happens! And, brethren and sistern, it usually happens.

"After many violent spasms have racked their interiors and exteriors, the truth comes out and two kilowatts of aggressiveness tell each other how much they hate each other. The battle is on! Friendships of a lifetime are cast aside and from then on the two pieces of junk refuse to agree to anything and generally act like maniacs.

"If one of the participants of the original fuss should happen to be married, woe unto his wife, for she is doomed for a time to live with a nut!

"The infection spreads like a dread, contagious disease and before long, whole communities of the fraternity are sadly affected. Hatred and distrust take the place of friendship and good will, and the whole thing becomes as satisfactory as a block on the subway.

"Now, friends, we will gaze upon the countenance of the corpse—the ugly thing that we are to bury tonight—and bury so deep that if it ever bobs up again it will be in the 77th radio inspection district of the Indian Ocean."

Reverentially, the casket was uncovered, revealing . . . an axe!

The dismal tones sounded a parting oration:

"This, friends, is the greatest enemy of the amateurs. Everything evil is represented in its ugly form—envy, distrust, unbelief in fellow man, bad fellowship and malice.

"As this ugly form is borne from this room tonight I beg of you all to bury all this evil with it. Always remember that in the ranks of the amateurs are the future Goldsmiths, Maxims, Godleys, Armstrongs, Whites, Warners, Batchellers, Gawlers, Pattersons, Schnells and Paddocks, who may become famous enough, to be invited guests at the Second Annual Dinner of the Second District.

"Once more, friends, I beseech you, be what you really are: the most persevering, enthusiastic and intelligent body of citizens on the face of the earth."

Solemnly the pallbearers gathered up their burden, the procession reformed and slowly they bore their burden away into the outer darkness, and firm and final burying of the elongated hatchet, to the orchestra's strains of "Good-bye, Forever."

And then it was time to go home. Though nobody wanted to.

Strays and What-Nots

L. R. BENSON (9ZB), of St. Louis, was one of the long-distance delegates to the convention. By the time he got through overhauling or being overhauled by all the amateurs he had worked over the air he was ready to call it a day.

L. G. Bates (1GY), of Worcester, Mass., who donated the Jupiter antenna wire used at the exhibition, disclosed the secret of that brand of wire and its remarkable efficiency in gathering in signals and radiating energy. As he carefully explained, it's all in the wire.

G. R. Entwistle enjoyed himself in great shape at the dinner. After a week of hard work in reporting the biggest event in the history of amateur radio for the Boston Traveler, he had a lot of fun watching some one else run a banquet.

On the afternoon of Friday, the 18th, a large, round white button made its appearance in the doorway. Once the visitors became accustomed to the glare of the shield it became apparent that there was a man behind it—old friend C. J. Murray (8ZA), of New Philadelphia, Ohio. No one has yet been able to figure out how he was able to drag that shield around on his coat and keep on his feet all the time. But it sure did put 8ZA and the town of New Philadelphia, Ohio, on the map.

Charlie Stewart (3ZS), of St. Davids, Pa., arrived on Friday, with a sad story. The power company had cut him off because he pulled so much juice with his "stone crusher" that when he closed the key the lights went out in the other seven houses in the town. C. W., Stewart—that's the answer. Hook 'er to a socket—that's all.

Lester Spangenberg and his 100 watt C. W. self-rectifying set, attracted considerable attention. It is suspected that 2ZM is at least a partial convert to C. W.

H. L. Stanley (2FS), originator of the phrase about it being "wonderful how much it was possible to get out of little bottles that had nothing in them," spent a large part of his time gazing into the depths of exhibited pliotrons, trying to figure out where it all comes from.

In all there were thirty-two exhibitors competing with each other in matters of display and noise making. The visitors got the impression that every existent spark coil, medical coil and static machine had been gleaned from all corners of the United States. Amplification stunts were continuous, signals both near and far came pounding in from all corners of the hall.

The Radio Corporttion of America had a tube display which was the envy of every deep-dyed-in-the-wool amateur. The 10 to 20 watts self-rectifying C. W. telegraph and telephone set occupied a prominent place in the booth. Particular interest centered in the complete 100 watt C. W. telegraph transmitter equipped with a 100 watt Kenotron rectifying unit which has recently been in regular use at 2ZL station. Another interesting set was the 10 watt C. W. unit built especially for portable use; it was enclosed in a small square case approximately one-half the size of an ordinary suitcase. This, too, is a self-rectifying set.

The Radiotron family included all tubes ranging from the U. V. 200 to the U. V. 204. Briefly, these are the detector tube, U. V. 200; the amplifier tube, U. V. 201; the 5 watt power tube, U. V. 202; the 50 watt power tube, U. V. 203; and the 250 watt power tube, U. V. 204.

The A. H. Grebe Co. had everything along the amplifier and regenerative tuner line. One particularly interesting item was the universal receiver having a range from 150 to 20,000 meters and equipped with three stages of audio frequency amplification and one power amplifier. Signals from LY, POZ and MUU came loudly and could be heard all over the hall.

F. M. Doolittle, of New Haven, with his amplifone and unique direct reading decremeter, was kept busy demonstrating and explaining.

At last hams were given an opportunity to see a real Paragon R. A. 10, life size, prominently displayed in the booth of the Continental Radio and Electric Corporation.

The American Electro Technical Appliance Co. gave the visitors a real treat by exhibiting all manner of radio appliances. Mr. Lolass supplied plenty of music with his Victrola and loud speaker when the band wasn't working.

Some one asked if the Amrad folks were selling receivers by the pound, as evidenced by the "Pounder Receiver." It's not yet known whether the word means that the signals "pound in" or whether the whole unit weighs a pound. There was a transmitter close by avertising the fact that it was a real "1 K. W."

The United States Army Signal Corps exhibit, in charge of Charles J. McBrearty, contained all sorts of transmitters and receivers, including trench sets, airplane sets and field sets.

"The livest club in New Jersey," the Radio Club of Irvington, was very much in evidence with all manner of radio sets made by Jersey amateurs including the Selvage Receiver, on which signals from a Pacific Coast amateur station were heard recently. Amateur clubs all over the United States, as well as prospective amateur clubs, would do well to communicate with the president of this New Jersey organization for pointers on how to keep members interested and happy.

A. F. Clough, in charge of the Convention Hall programme, deserves credit for keeping things moving in good shape. He was able to secure a number of the best authorities in the east on amateur problems and the Convention Hall programme was extremely interesting and attracted large audiences.

John Di Blasi did his part of the job early and was successful in selling all the available space by means of printed matter and a good business argument. The executive of one concern, who hal refused to sign on the dotted line before the exhibition, hunted up Mr. Di Blasi at the show and claimed he had a kick coming because the magnitude of the undertaking had not been properly presented to him. No reply from Di Blasi. He was afraid to talk for fear of saying something.

Leroy Watkins cultivated quite a muscular development in the arms by carrying home the cash every night. Around $200 in pennies, dimes, nickels and quarters gets quite heavy after a while. The satisfaction Mr. Watkins got out of his job was that all this small cash checked to a cent with the admission records.

Sergeant C. E. Pearce, of the Radio and Telegraph Division, New York Police Headquarters, who was responsible for securing the fine quarters at the Pennsylvania Hotel for the exhibition, was warmly congratulated by everybody on his selection. The feeling of the committee is that he did his part of the job so well that he has worked himself out of a job—at least that particular job—for next year.

Mr. Glavin's wirelessly controlled torpedo seems to have a vengeful spirit. One man in the crowd watched it for a few minutes, and then remarked, audibly, "Aw, that's another fake." The next time the torpedo came around his way it sideslipped and bumped the incredulous one in the shins.

A former Bowery Bum was an interested spectator during the exhibition. A police detective recognized him and asked him what he was doing there, "Oh," said he, looking Godley-ward, "I've been regenerated since I took up wireless."

The Radio Traffic Association had 48 representatives at the dinner, about 75 per cent of its total membership. The Brightwaters, L. I., Radio Club had a 100 per cent attendance record; the membership was Mr. V. F. Camp (2RL).

The old saying, "busier than a one-armed paper hanger," no longer has any significance for R. H. McMann. "MC" reached the saturation point several times during the week. Taking care of the wants of 35 exhibitors, and looking after all the other thousand-and-one details of an affair of the size this one turned out to be, was a regular man's sized job. He was equal to it.

C. J. Goette and J. N. Ferguson, the "power and demonstration committee," fully qualified as steeplejacks. The temporary antennae erected on top of the 75-foot framework of the big sign on top of the hotel, gave excellent service and the power arrangements satisfied everybody, which is some accomplishment.

The great mystery of the exhibition: "What happened to Chief Taber's circus?"

Thirty-one amateur first grade licenses were issued to amateurs during the convention by the Radio Inspection Service of the Department of Commerce. This special service was an important feature of the convention and was a great convenience to many amateurs, who were able to attend the exhibition and secure amateur licenses at the same time. This courtesy of Chief Radio Inspector Batcheller was another instance of the cooperation existing between the Department of Commerce and the amateurs.

Eleven members of the crew of 3XM (formerly 3DH) were present at the dinner. The other one couldn't get there.

The Executive Radio Council got the biggest jolt of its life on paid admissions. The Council figured $150 as a maximum. The total was just a little short of $800 for the four days.

The attendance at the lectures in Convention Hall exceeded all expectations. Seating capacity was provided for 400, but proved entirely inadequate. During the lectures the standees were at times twenty deep around the rear of the hall.

Friday night was the largest in point of attendance in Exhibition Hall of any other time of the week. Between 8 and 10 P. M., there were 1,200 persons in the hall. The place was just about full.

In the United States Navy booth, where much amplification was constantly going on, we heard a chief electrician explaining to a visitor of the fair sex the qualities of high and low speed galena crystals. Finally, "Vice Admiral" Dannals appeared and we heard something about a new detector circuit having been discovered employing two crystals, one on each side of the circuit so designed and planned that each one was supposed to rectify one-half of the incoming cycle. The main trouble with this new hook-up, however, was the extreme difficulty of adjusting these two crystals to synchronism.

But the prize winning wise crack was the one made to H. C. Gawler, in the Radio Corporation's booth, by a visitor who thought he'd like to have a duplicate of the exhibited self-rectifying set if assured that he could have a steady supply of positive and negative tubes.

No report has been received from Miss Mae Lupton, residing at 2 East River, as to how many amateurs dropped in.

The official photographer offers, ready for framing, one besmudged portrait of the dreamy youth who collided with the camera just as the flash powder went off.

Who attached the "High Voltage!" sign to Eleanor Sreboff's shapely back? Musta been T. O. M., replied Elizabeth Rickard, for nobody nose.

One-twelfth of a dozen coherers is the prize award for identification of the youth in short pants who started tuning in on the three-stage amplifier as the official relay station opened up—40 feet away—with its half kilowatt. Finder will please return one pair damaged eardrums and one quart pearly teardrops.—adv.

General Russel wouldn't stand for any special honors. He begged the committee to let him wander about "like any other amateur."

John (old 2PM) Grinan reported a regrettable oversight in his neglect to sign on the dotted line before he left the conference and side exhibit in a room (with bathtub) on the eighth floor. He writes that it's the first opportunity he has missed since he bought a carpenter's pencil for a potentiometer in 1909 and charged the three dollars to experience.

"Yes, variometers can be used with a B battery," said A. H. Grebe, unsmilingly, at one stage of the proceedings.

What a day for Old Timers when Dr. Goldhorn (old 2AX) came down unannounced from Mount Vernon!

Maybe St. Louis and New York will now get together and elect Mine Host Statler an honorary something or other for radio convention sheltering.

New Record Made in Code Contest

B. G. Seutter, an operator of The New York Times Transatlantic Radio Receiving Station, finished first in the code receiving test, and established a new record of 48 3-5 words a minute, with only two typographical errors.

There were more than sixty contestants, including two of the most skillful operators from the Radio Corporation of America, a large delegation from the Western Union, a number from the Navy's coastal stations and from the Independent Wireless Telegraph Company, as well as from other companies. The contest was an elimination contest and started at 30 words a minute, which eliminated about one-third of the contestants.

It finally narrowed down to N. Bernstein, an instructor, of the Western Union School, and Mr. Seutter, and three separate trials of two minutes each were necessary before the judges announced Mr. Seutter as the winner.

In recognition of his feat, Mr. Seutter was presented with a silver loving cup.

Mr. Seutter's radio experience dates from 1913. During the World War he was in the United States Navy and was stationed at the radio station at Otter Cliff.

He was one of the navy operators specially assigned to receive confidential messages from the U. S. S. George Washington during her two trips to France and back with President Wilson.

In connection with the world's championship code speed contest, Mr. A. I. Isbell, Pacific Coast Superintendent for the Radio Corporation of America writes:

"My attention has been called to the fact that in the recent radio competition held by the second district amateur radio convention in the Hotel Pennsylvania, the claim is made that the world's record was created by Mr. B. G. Seutter, operator employed by the New York Times, who succeeded in receiving plain language at the rate of 48 3-5 words pere minute, with two typographical errors. In the competition held at an amateur radio convention in San Francisco recently one of our operators employed at Marshall, Mr. Tony Gerhardt, carried off the first prize by receiving 49 1-3 words per minute. Mr. Gerhardt also broke the world's record in the San Francisco Exposition competition. It would seem, therefore, that Tony Gerhart's world record still stands."

B. G. Seutter who won the code speed contest for which he was awarded the handsome cup shown in the photograph

The Executive Radio Council of the Second District announces, in explanation of the above, the number of words per minute credited to Mr. Gerhardt was 49.25, for 4 minutes, 197 words total, with 5 errors, a net result of 39.4 words per error.

Mr. Seutter's record was 48.6 words per minute, for two minutes, total 97.2 words, with 2 errors, a net result of 48.6 words per error.

The Executive Radio Council has therefore decided that, figured on a "words per error" basis, the world's record for accurate and speedy reception was broken by Mr. Seutter.

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

A Commutator, Interrupter and Synchronous Ga

By George E. Hild

First Prize $10.00

THE interrupter described in the following article is of the commutator type with a synchronous gap on the same shaft. This type of interrupter has several advantages over the vibrator type. With the latter type it is sometimes difficult, if not impossible, to adjust the vibrator so that it maintains a constant note. The contacts of such a breaker would have to be of generous dimensions and would undoubtedly have to be replaced frequently to break a current of 5 amperes at 110 volts.

The commutator type of breaker on the other hand maintains a note of constant frequency which every amateur desires. The first step is to secure a motor to drive the commutator. A second-hand fan motor can be bought reasonably. Next, procure a base 12 inches long by seven inches wide, ⅜ inches thick. Bakelite or hard rubber should be used, but a piece of well-seasoned hardwood will do. If the latter is used, it should be given a good coat of shellac to make it moisture proof. The motor should be mounted on one end of the base as shown in the drawings.

As the shaft of the motor will not be long enough to mount the commutator it will have to be extended. A piece of cold rolled steel, 4½ inches long of the same diameter as the motor shaft is connected to the shaft by means of a coupling. This can be made from a piece of shafting ¾ or one inch in diameter by drilling through it. Two set screws should be provided to clamp the shafts tightly.

A bearing to support the long extended shaft will also be necessary. This is made of a block of hardwood four inches long. It tapers from two inches at the bottom to one inch at the top, and should be neatly rounded off.

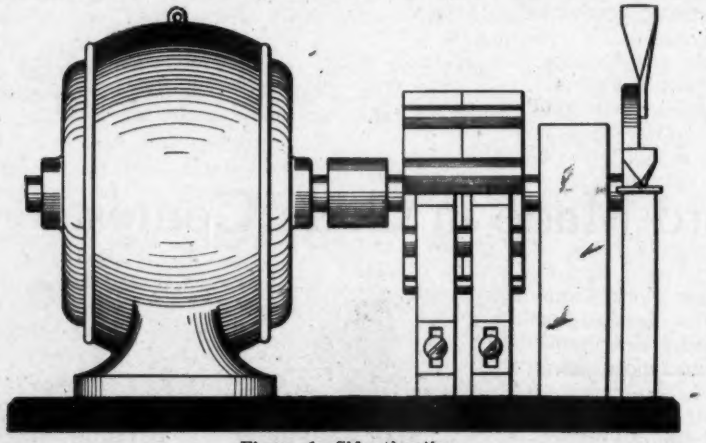


Figure 1—Side elevation

The bearing may be a brass or bronze bushing or it may be made of babbit by fitting two washers to the shaft and clamping them tightly to the bearing block. Babbit is poured through a hole drilled in the top of the block. After cooling this is drilled to permit oiling the bearing.

The commutator has two ca brushes which make a double br This is a desirable feature as it duces sparking. It has sixteen ments and makes eight breaks revolution. Figuring the motor 3600 revolutions per minute a not 500 cycles (450 to be exact) is duced. If the prospective bui wishes to have a 240 cycle note, eight segments are needed.

Procure a piece of brass or co tubing three inches in diameter two inches in length. Make a of fibre or hardwood and forc into the tubing. Divide the comm tor into sixteen equal parts by m of a pair of dividers. After thi done drill a hole ½ inch from ends of each section. Small flat h wood screws inserted in each h make two screws for each segme

Cut through the tubing with a h saw into the core about ¼ of an on each mark dividing the sect After this is done take off every o section. Make a hack saw cu the center of the commut

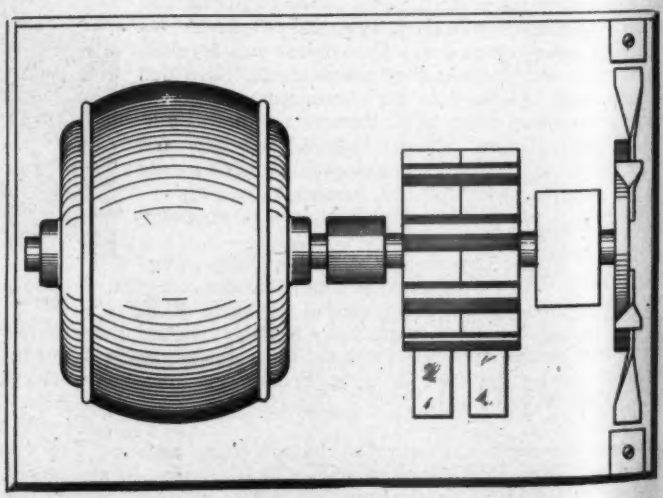


Figure 2—Plan view

clear around, ¼ of an inch separating the segments in halves. The slot between each segment is filled with mica which been dipped in shellac to cement the grooves. The other segment now replaced and the cuts betwee segment is filled with mica coated

shellac. It is next turned down in a lathe or filed off smoothly so that no mica insulation or screw heads protrude. A hole is drilled in the centre of the commutator for the shaft. This commutator with its wide brushes and double break will easily take care of a ½ kilowatt transmitter.

The brushes, as shown in the drawings, consist of carbon blocks one inch long, ⅝ inch wide and ¼ inch thick. They are supported by holders of $\frac{1}{16}$ inch brass, and are in two halves, one of which is slotted. They are clamped together with a screw and nut, which allows an up and down adjustment.

The description shows how this commutator operates. When a whole segment is in contact with the brushes the circuit is closed; when the insulated half-segment is across the brushes the circuit is open.

The rotary gap shown in the drawing is very simple and needs little description. The disc is a piece of bakelite three inches in diameter and ¼ inch thick, which is clamped to the shaft by two nuts. Eight electrodes are secured to the edge of the disc by screws and nuts. A copper ring, three inches outside and two inches inside diameter, is also clamped to the disc. This is to connect all the electrodes together electrically. The electrodes are made of copper strip 1½ inches long by ½ inch wide and ⅛ inch thick. After drilling a hole ¼ inch from the end to receive the screw they are clamped in a vise and with a heavy pair of pliers twisted till the ends are at right angles to each other. If this proves difficult the copper may be annealed by placing it in a fire, care being taken not to burn it. Dipping them in a weak solution of sulphuric acid will remove the black scale caused by oxidation.

The stationary electrodes, which are one inch long, ⅝ inch wide by ⅛ inch thick, are carried by two ½ inch hexagon rods, three inches long. Care should be taken to have both rods exactly the same length. Both electrodes are slotted to allow for adjustment. The stationary electrodes are secured to the posts by machine screws. This completes the gap.

Before the interrupter is put into service it should be carefully adjusted. The two brushes should be adjusted so they break the circuit simultaneously.

The proper adjustment for the stationary electrodes can best be found by experiment. The same applies to the adjustment of the rotor of the gap in relation to the commutator. A condenser of ½ or 1 microfarad shunted across the brushes will reduce the sparking.

A Turbine Type of Mechanical Interrupter

By E. Molyneux

Second Prize $5.00

THE following shows the design of a mechanical interrupter of the turbine type whose action is explained as follows. Owing to centrifugal force the mercury (see figure 2) is forced through the holes in the bottom of the rotor and passes out of the nozzles in the form of a jet which makes contact with the brass lugs once every revolution. This interrupter is cheap to construct and will easily handle ½ kw. without any condensers across it and with practically no sparking.

Obtain a piece of brass pipe four inches in diameter and three and a half inches long with a flange already on as shown in figure 2. This can be supplied from the junk box of the local plumber. Cut out a brass plate ⅛ inches thick, the diameter of the flange, drill half way through this in the center with a sharp twist drill and solder this plate to the flange.

Now make a plate cut to the dimensions of detail "B" out of ⅛ inch sheet brass, and solder in position as shown in figure 2. This plate is for the purpose of stopping the rotating of the mercury.

The next item is the rotor, which requires careful construction. A small lathe is necessary, or better still, the job can be turned over to a machinist. The construction is as follows:

Obtain a piece of brass rod 2 inches in diameter and 3½ inches long and turn it up in the lathe to the dimensions in detail "A." Its appearance in the lathe will be as shown in figure 2A.

The shaded portion shows where the metal has been cut away. The piece "A" merely provides a centre for the work.

Figure 2A

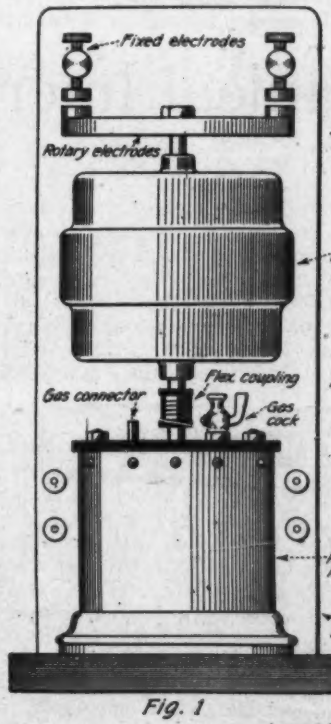


Fig. 1

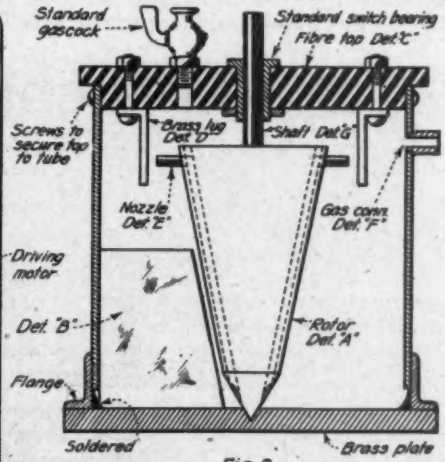
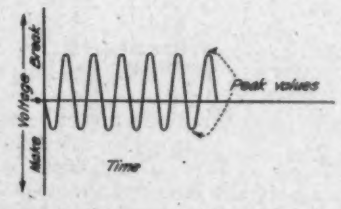


Fig. 2



Assembly of various parts

A hole is drilled ½ inch deep and tapped 6/32 inch thread at the top of the rotor. Two more holes opposite each other are drilled with a $\frac{1}{16}$ inch drill parallel with the sides of the rotor till they emerge out of the bottom. These are both plugged at the top by tapping and screwing in a piece of threaded brass to a depth of a quarter of an inch and cutting off the rod flush

with the top. Two holes for the nozzles are run into the latter holes. These are drilled to receive a $\frac{3}{16}$ inch tap. This completes the most difficult part of the interrupter. The top portion (detail "C") on which the lugs are secured is made preferably of fibre, but hard wood may be used. The complete interrupter is assembled as shown in figures 1 and 2. The details will be understood from the individual drawings.

To operate, first connect the gas supply to the gas connector and open the gas cock, thus allowing the gas to run through the break till all air is driven out. Then close the escape cock leaving the gas supply on and start the motor, switching the spark coil into the circuit. The break operates without gas but for maximum efficiency its use is desirable. If no gas supply is available it is a simple matter to make a hydrogen generator. The advantages of this interrupter over other types of mercury interrupters are:

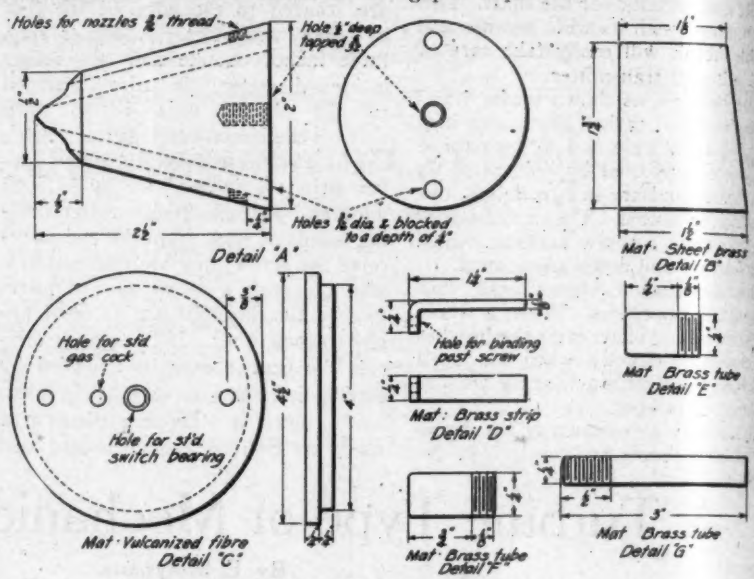
1. Rotary movement, therefore mercury not churned.

2. Gas dielectric, therefore no slush, as in breaks, using alcohol.

3. Higher speed of interruption per second compared to other mechanical breaks.

As shown in figure 1 a rotary spark gap can be fixed on the other end of the driving motor which can be adjusted so as to be synchronous with the interruptions. Consider figure 3, which shows the relation of the sparking voltage to the time. Maximum efficiency is obtained when the discharge takes place at peak value. The best indications of this condition is when on pressing the key during transmission the rotary spark gap does not appear to be moving. This optical effect is a reliable indicator.

To obtain synchronism with the interrupter here described only a four stud spark gap must be used. The speed of the motor determines the spark frequency, but one more pair of brass lugs will double the number of interruptions. Should two pairs of lugs be used an eight stud rotary gap is required.


Holes for nozzles ⅛" thread
Hole ¼" deep tapped ⅜
Holes ¼" dia. ½ blocked to a depth of ¼"
Detail "A"
Hole for std. gas cock
Hole for std. switch bearing
Mat: Vulcanized fibre Detail "C"
Hole for binding post screw
Mat: Brass strip Detail "D"
Mat: Brass tube Detail "F"
Mat: Sheet brass Detail "B"
Mat: Brass tube Detail "E"
Mat: Brass tube Detail "G"

Detailed constructional views

$$\text{Spark frequency} = \frac{\text{Revs. per min. X No. of interruptions per rev.}}{60}$$

Any desired spark frequency can be obtained with this synchronous spark gap and the purity of the note obtained is remarkably clear. A vital factor in the construction is the gas tight fittings that are necessary.

A Mechanical Interrupter

By C. F. Rudolph

Third Prize $3.00

THE mechanical interrupter illustrated in the accompanying drawing is of the well known "commutator" type. It is designed with the intention of providing an easily constructed device and embodies a multiplicity of breaks in series, with large contact surfaces.

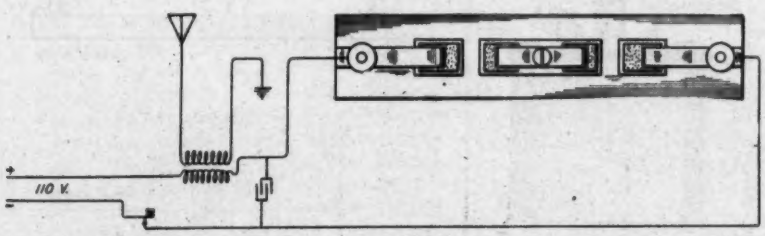


Fig. 1

Circuit showing hook-up

To construct this interrupter a cylinder of hard rubber, bakelite or other suitable material is drilled all the way through with a suitable number of holes on a "bolt circle." Into these holes, from each end, are driven a number of short lengths of round copper or brass rod which may be pinned or shellacked in place. The periphery is then turned down on a lathe until a suitable portion of the metal surface of the rods are exposed to form contacts. This cylinder is then mounted on a shaft fitted with a pulley, as shown and the whole supported in bearings of a frame which carries the contact brushes.

The brushes are fitted free to slide in rectangular guides in the frame and are connected in series through the brush-holder spring. This provides four breaks and the rate of contact separation will therefore be four times the peripheral speed of the cylinder.

The interrupter is driven by a small motor, preferably by belt connection, which provides a means for speed adjustment by using pulleys of various diameters, in addition to the speed variation which can be obtained by motor control. The number of contacts per second or frequency of impulses in the primary will equal the number of revolutions per second times the number of contacts per revolution.

The large contact surfaces reduce the current density and hence the heating effect of the current when passing through the brush contacts. This tends to reduce the evil effect of sparking as will be confirmed by a consideration of modern designs of controller contactors and high speed commutators on direct current machinery.

The most "pep" from an induction coil is obtained from the inductive

discharge upon the opening of the primary coil circuit due to the so-called collapse of the magnetic flux. This flux also cuts the primary coil and if the interrupter points are sufficiently close (although moving apart) when a striking voltage has been induced in the primary coil a spark jumps back across the interrupter gap. This discharge has the effect of lowering the maximum voltage induced in the secondary coil. In the interrupter shown the rate of separation of the contact points is multiplied by the number of contacts used and the undesirable effect of a sparking voltage being induced in the primary is greatly reduced.

In interrupters of familiar types a condenser is bridged across the gap. This condenser absorbs the energy induced in the primary coil by the collapsing flux, which energy is later returned to the system. A condenser of about .004 mfd. is necessary in the interrupter shown. This capacity, of course, depends on the characteristics of the induction coil, but if a condenser be used it must be of the smallest possible capacity necessary to eliminate sparking, in order that the maximum high voltage may be induced in the primary.

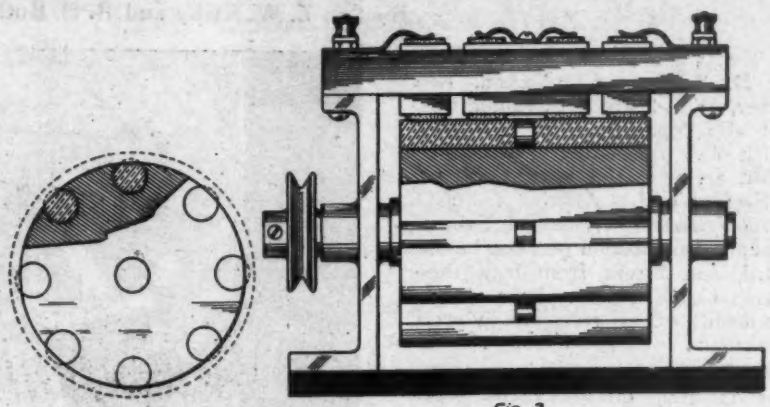


Fig. 2 Fig. 3

Assembled and sectional view of rotor

Simple Capacity and Resistance Units

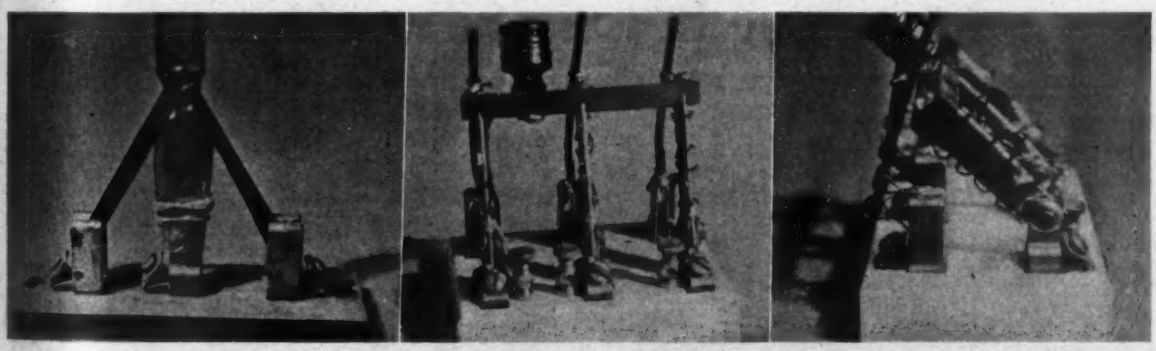
By R. U. Clark 3rd

FOR extreme sensitivity and long distance reception the radio frequency amplifier is considered better than all other types. Audio frequency couplings are especially useful for increasing the volume or intensity of sound, but their effect on sensitiveness to weak signals is not so marked as with the high frequency amplifier.

The necessary parts for the instrument are one or more double throw switches, a small fixed condenser or the material to make one, a few brass wire paper clips, some narrow strips of cardboard, about 2x¼x$\frac{1}{32}$ inches and a little carbon ink.

The condenser can be clamped to the blade of the switch, and one end

Connections can be made to the complete unit through the three binding posts which are incorporated in the switch, and also the wire or other connection provided at the other condenser terminal. The finished device will be found to work very well. The best results can be obtained by coating the resistances with wax.



Single and multiple pole switches rigged with capacity and resistance units

The simplest form of radio frequency amplifier is the resistance coupled set so popular for use on the long wavelengths. The only objection to the use of such a system for amateur work is met with in connection with the usual vacuum tubes, in which the internal capacity is so great as to make their use on short waves practically impossible for high frequency work. By the use of special tubes, or the Armstrong Super-Autodyne hook-up, high frequency amplification can be made satisfactory on short wavelengths.

A resistance and capacity unit for use with radio frequency amplifiers and in radiophone work is described in the hope that it may be of value to those who possess sets of this nature.

electrode soldered to the switch-blade, the other being fitted with a binding post. If so desired the blade of this switch can be used as one of the condenser plates, for as one end of the condenser is grounded to it the effect is the same. The inked resistances are also grounded through the same blades.

One of the brass wire clips is now soldered to the upper end of the switch blade, and one in each of the two contacts, in such a manner that the two pieces of carbon coated (inked) cardboard can be inserted so as to form a bridge from each contact to the top of the blade of the switch. The brass wire clips are used to do away, as far as possible, with undesirable capacity effects of the high resistance units.

In making up a number of these units it will be found cheaper, and as a rule better, to use double or triple pole switches instead of single pole ones. The blades of these will make very neat condenser electrodes, around which a sheet of mica and brass or copper can be rapped and soldered to complete the condenser.

For experimental work a variable resistance will be found desirable, and by using a three-pole switch three resistances can be varied at once. These resistances of any desired value can be used for grid leaks or coupling resistances. Fixed grid leaks can be mounted on the switch base and furnished with separate binding post, or in some cases they can be connected to the switch posts direct.

Amateur Trans-Continental Spark Reception

By Leo E. W. Kirby and R. H. Butler

AT 2:55 a. m., January 4th, Howard D. Selvage of Irvington, New Jersey, 2KF, heard 6EA calling 6GO and also copied part of a message which 6EA transmitted to 6GO.

Mr. Selvage wrote to 6EA, Mr. H. C. Seefred, of Los Angeles, and 6GO, Gordon Bennett, of Oakland, Cal., requesting confirmation of what he had heard, and letters from both these Pacific Coast amateurs have verified the details of his reception in every particular.

H. C. Seefred is a well-known amateur operating on the Pacific coast. He has an unusually well equipped station for an amateur, and had previously succeeded in establishing several records for long distance transmission. He has been heard in Juneau, Alaska (KDU) in Honolulu, and as far east as Fort Wayne, Indiana, (9ME). The fact that he had been heard on the Atlantic coast, however seemed too good to be possibly true until reference to his log book showed that the message which Selvage's letter quoted, absolutely corresponded to his record of transmission. Gordon Bennett, the amateur on the other end of the Coast conversation, also found that his records coincided with the claim.

Howard D. Selvage and his 2KF Station

Mr. Selvage's station is located at his home, 45 Durand Place, Irvington, New Jersey. The apparatus was designed by Arthur G. Wester of Hilton, New Jersey, and was erected by the pair. Wester is a prominent member of the Radio Club of Irvington, N. J., and is well known in local radio circles. Although only seventeen years old, he has been interested in radio for nearly three years and has been very successful in designing radio apparatus. The Selvage station contains several advanced ideas of Wester's which have worked out very successfully in actual practice.

The station consists of a detector and three stages of andio-frequency amplification, and a loose coupler in miniature form, entirely home-made. A regenerative circuit is employed in conjunction with a tickler feed-back. Selvage used A-P tubes and Baldwin phones at the time of his trans-continental reception.

(*Continued on Page* 32)

Measuring Losses of Transformer

By L. R. Felder

THE attention of electrical and radio experimenters seems to be so rivetted on vacuum tube circuits and their operation that it may seem elementary and antiquated to speak about transformers. But there are many of us amateurs who still use spark transmitters and power transformers, and the information contained in this article may be of use to those who still believe in the spark transmitters and who use transformers in their experimental work. The power transformer is certainly an important piece of apparatus, and this article is designed to enable amateurs to obtain important data on their transformers without the use of expensive meters.

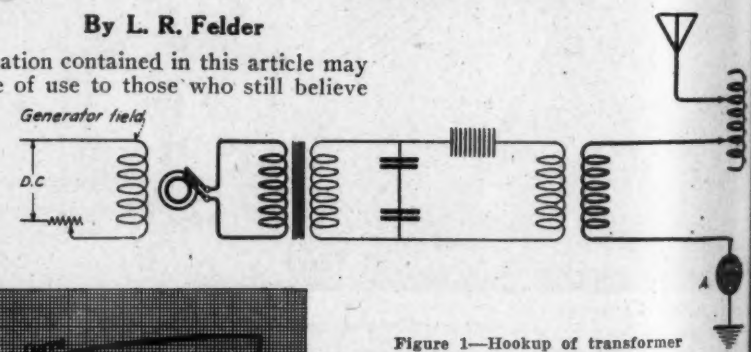


Figure 1—Hookup of transformer

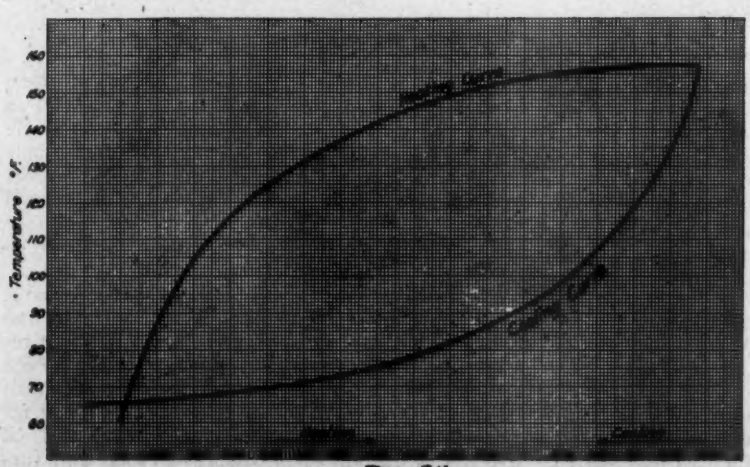


Figure 2—Graph of heating and cooling curves

Generally in laboratories that can afford wattmeters of all sorts, the copper and iron losses of transformers are determined by actual measurement with wattmeters, voltmeters, etc. While estimates can be made there is really nothing like an experimental determination of the losses.

The following is a very simple method for determining transformer losses, in which the only apparatus required is a watch and a thermometer. The copper and iron losses of a transformer are dissipated in heat, which results in a rise of temperature of the iron and copper. The method is based on a determination of the rate at which this temperature rises. This method has actually been used on 1 k.w., 2 k.w. and 5 k.w. resonance transformers operating at 500 cycles, and the results were checked up against wattmeter determinations and found to be accurate within 5 to 10 per cent.

The transformer is connected in the circuit as it always is when in operation. In our case we had it connected in circuit with the usual quenched spark gap as shown in figure 1. Let us now consider the measurement of the iron losses. The iron loss will be different for different excitations of the primary, but we are always interested in the loss at the operating voltage, 120 or 140 volts, or whatever it happens to be. It is not necessary to have the gap working, so disconnect it leaving the secondary of the transformer in open circuit and readjust the generator field rheostat to the working voltage.

The thermometer should be placed in close and direct contact with the iron and should be carefully packed in waste. Take the temperature of the cold core at the start and make a note of it. Now close the switch. Thereafter take temperature readings every five or ten minutes and make note of the time and temperature as both are important. It is preferable that for the first fifteen minutes or so readings be taken more frequently, say every three minutes as the rate of temperature rise during this period is the important factor in determining the loss. Make a mental note of the rate of temperature rise, or better still plot temperature against time during the run, and when the rate of temperature rise begins to fall (indicated by a flattening out of the curve) readings may be taken every five or ten minutes. Continue this until the core temperature has reached a practically constant value, then open the main switch and take a cooling curve. Some transformers may be so poorly designed that the temperature rises to very high values and does not reach a constant value for three hours or more. In this case when the temperature reaches about 100° C. open the main switch and

Three Good Reasons Why You Should Study Wireless—

Good Pay
Unlimited opportunities for advancement
Radio field expanding rapidly

Our school is fully equipped with modern apparatus and has every facility at its command to qualify you in a limited space of time for examination for a first grade commercial license. Our fees very moderate.

Spring term class now commencing
Write today for descriptive booklet B

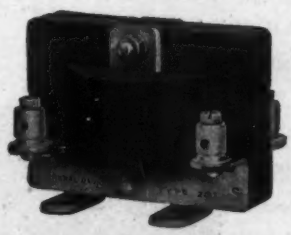
Y. M. C. A. Radio School

MARCY AVE., NEAR BROADWAY, BROOKLYN, N.Y.

Telephone: Williamsburgh 3800

INCREASE YOUR C-W RANGE

By Using Correctly Designed Modulation and Amplifying Transformers



Type 231 Transformer

Now that vacuum tubes have become standardized, it is possible to design transformers for particular tubes. We have produced two transformers to meet specific conditions. The first is the Type 231A Amplifying Transformer for the Radiotron UV-201 Amplifier tube, and the second the Type 231M Modulation Transformer for the Radiotron UV-202 Oscillator tube. If you want to get the maximum amplification from your amplifier unit, or to get the maximum modulation of your CW transmitter current, use our Type 231 transformers built for these specific purposes. Send for Bulletin 907W describing these instruments.

Price, Either Transformer, Completely Mounted, $5.00

GENERAL RADIO CO. **CAMBRIDGE 39, MASS.**

SUCCESS OPPORTUNITY

UTTMARK'S NAUTICAL ACADEMY RADIO SCHOOL

NEW YORK BOSTON

Offers a thorough course in all branches of wireless telegraphy. Radio Operators earn at the start $125.00 per month, and first class board, etc., free. Our school prepares you for your license in three to four months. Positions guaranteed to first grade licensed operators.

DAY AND EVENING CLASSES

The leading Nautical School in U. S. A. Established 1804

CAPTAIN F. E. UTTMARK, Principal

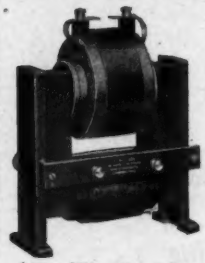
Write, call or phone for illustrated booklet

8 State Street **New York, N. Y.**

Facing Battery Park, N. Y. *Telephone, Bowling Green* 8079

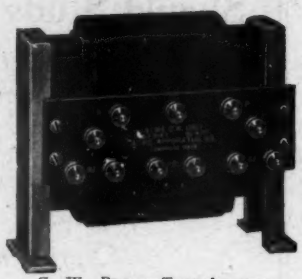
UTTMARK'S for Nautical Education

ACME APPARATUS



Acme 250, 500, 1000

Spark Transformers
C. W. Power Transformers
Modulation Transformers
Amplifying Transformers
Filament Heating Transformers
Special Transformers
Amplifiers
Detectors
1½ Henry Choke Coils
Anti Light Blinkers



C. W. Power Transformers

The ACME SPARK TRANSFORMERS have the highest efficiency, highest power factor, highest spark frequency and lowest price of any on the market. Acme 250, Acme 500, Acme 1000.

The ACME C. W. POWER TRANSFORMERS are for use with rectifying devices or for A. C. directly on the plates of power tubes. 50 watt, 200 watt, 500 watt.

The ACME MODULATION TRANSFORMERS give maximum modulation without distortion. Type A-3.

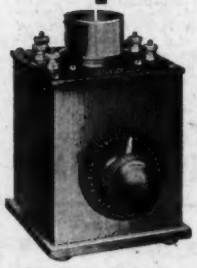
The ACME AMPLIFYING TRANSFORMERS are the result of experiments by transformer and radio engineers. Correct ratio and impedance. Type A-2.

The ACME FILAMENT TRANSFORMERS allow the use of A. C. for power tube filament heating with easy control. 75 watt, 150 watt.

The ACME AMPLIFIER and ACME DETECTOR contain in a small space what so often requires considerably more.

The ACME CHOKE COILS are 1½ Henries for use in ironing out and for modulation.

The ACME ANTI LIGHT BLINKERS eliminate blinking of lights when transmitting.



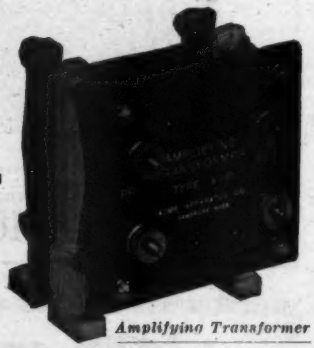
Amplifier Detector

Ask Your Dealer to Show You

ACME APPARATUS

Bulletins describing the above sent on request.

ACME APPARATUS COMPANY



Amplifying Transformer

190 Massachusetts Avenue, Cambridge 39, Mass.
Transformer and Radio Engineers and Manufacturers

Radio Club Pins

Special folder of designs and prices in addition to regular catalog free on request. Be sure to see these new numbers which will put new life in your club.

Metal Arts Co., Dept. 13, Rochester, N. Y.

TYPE J D. C. MILLIAMMETERS, $6.00 0-50, 0-100, 0-300, 0-500 M.A. Also 0-3 Amps. 3¼" D. flush type. A high grade D'Arsonval instrument sold on a *profit-sharing* basis. **Type J, 0-500 Voltmeter, $16. 0-1000 $24 Type JX A. C. 0-15 Voltmeter ..... 8** 3¼" D. flush type, magnetic vane movement and jewel bearings. For power tube filaments.

SOMERVILLE RADIO LABORATORY
Winter Hill (45) Mass.

take the cooling curve. It is not advisable to go beyond that temperature as it is injurious to the insulation. The cooling curve is taken in the same way as the heating curve. That is, the temperature, which is now dropping, is taken every five or ten minutes.

The frequency of the alternating current should be constant throughout the run and the voltage across the primary should be kept constant as the losses depend upon and vary with both these factors. The curves should be plotted as shown in the accompanying plot, temperature against time.

This finishes the experimental work and the calculation follows: The method is based upon the rate at which the temperature of one pound of water rises when power at the rate of one watt is dissipated in it. Knowing the specific heat of iron we can calculate from the preceding the rate at which the temperature of one pound of iron will rise when power at the rate of one watt is dissipated in the iron. From our heating curve we determine the rate at which the iron temperature actually rises due to the losses. If we divide this actual rate of temperature rise of the iron by the rate of rise produced by a loss of one watt per pound we get the watts per pound actually lost in the iron. Multiply this by the weight of the iron and we have the total watts lost in the iron of the transformer. The preliminary calculation determining the rate at which one pound of iron will rise when one watt is lost in it will now be made and this result will be used in the actual test made with a 5 k.w. transformer.

Determination of Rate of Rise of Temperature of 1 lb. of Iron When One Watt Is Lost in It:

1 H. P.=33,000 ft.-lbs. per minute
1 H. P.=746 watts

$$1 \text{ watt} = \frac{33{,}000}{746} = 44.2 \text{ ft.-lbs. per minute}$$

It is found by experiment that when 778 ft.-lbs. of work disappear, the heat generated will raise one pound of water 1° F. This is the mechanical equivalent of heat and is expressed as

Ghegan Patent

Bunnell Instruments Always Satisfy

Our Jove Detectors Simplest and Best

Beware of Infringing Imitations
Sample mailed for $2.00 Tested and Guaranteed Galena 25 cents
Our Keys, Spark Gaps, Condensers, Transformers, etc., are high grade but inexpensive

Distributors of Standard Electric Novelty Company Type B "Cyclone" Audion Batteries. Also DeForest, and all other makes of High Class Wireless Apparatus.

Send stamp for our No. 42-W Catalog.

J. H. BUNNELL & CO. - - - - 32 Park Place, New York City, N. Y.

They're Off for the "Promised Land"

Enrollments are coming in by every mail. Wideawake wireless men have seen the new and greater opportunity opened to them by the Home Study Course, which is specially designed to land them one of the enviable jobs at the world's greatest radio station.

"The Promised Land" is the name professional operators have given to the New York Radio Central Station, on Long Island. The picture shows the mast foundations going in. Soon the giant steel towers will rise high into the air. The new four-continent station is rapidly becoming a fact. When completed, this station will be the largest and most powerful radio station in the world.

It will be equipped to work simultaneously with five other nations in widely separated and distant parts of the world, and will be epoch-making in the field of international communication.

A large number of trained men will be required for its operation and maintenance.

A position at this station is the height of every operator's ambition, for it means unlimited opportunity to succeed and progress to higher, more responsible and better paying positions in the radio industry. So far as opportunity goes the successful future of these men is assured.

How about you?

Right now, today, radio offers you big opportunities—if you are properly trained. Radio companies need trained executives, engineers, draftsmen, operators and mechanics. Hundreds of positions in the ever-broadening field—from ship operator to general manager—are open to you, if you have the required training.

The Radio Institute of America will give you this training, as it has to thousands of others. If you cannot come to the Institute, the instruction will come to you—to your home.

This new home course of radio training, which has been developed for the benefit of those who cannot attend the Institute personally, is the same course used at the Institute. It includes everything from basic principles of electricity and magnetism, to actual operation of commercial radio equipment. It also includes the same textbooks used in the Institute classes, as well as a buzzer set of greatly improved design, with a variable automatic transmitter, for code practice.

The graduates of the Radio Institute of America enjoy a great and exclusive advantage in the close connection existing between the Institute and the Radio Corporation of America, world's largest radio manufacturing and commercial radio company.

Prominent executives in the radio field are former students of the Institute. The Radio Corporation employs thousands of men, in its executive departments, on ships and at shore stations and in factories and laboratories. A large percentage of these men are graduates of the Institute.

The Radio Institute of America has been an established and successful institution for over fifteen years. The year round average attendance in its classrooms is now 298 students per month. It has trained over 6,000 men, 95% of whom have successfully engaged in this new branch of science and industry.

You, too, can be successful in this new field if you properly train yourself by means of the Home Study Course of the Institute. Radio offers an unlimited opportunity for future advancement—why not take advantage of it.

Write for our booklet and further details—*Now*.

HOME STUDY DIVISION

Radio Institute *of* America

(formerly Marconi Institute)

326 Broadway, New York

ELECTRIC TONE-A-PHONE

Music Over Wire and Through the Air.

This Phonograph Arm Complete with powerful 4-button Microphone, will send music from your station far stronger than any makeshift. It is direct and no sound or power is lost. Attaches to any phonograph without tools, and without removing regular arm.

When you give a—Radiophone Concert—give it right. Use your favorite phone circuit with the Tone-A-Phone.

Send for Literature

VITALIS HIMMER MFGR. 205 Sixth Ave., New York

WIRELESS TELEGRAPHY

CHAMBERS INSTITUTE. A High-grade School where Radiotelegraphy is taught in all its branches, beginning with the Code, and going straight through. Theory taught by Lectures, blackboard, and practical demonstrations of Apparatus, both during the course of construction and when completed. A large Wireless Station, (3XC) with Motor-generator Set complete.

We spare no pains to make Our Students first-grade Commercial Operators, and give special attention to backward students. Location very central. Convenient to both railroads, and all trolley lines.

We also carry a full line of all standard makes of Wireless Apparatus. Parts a specialty. Call, 'phone or write for particulars.

CHAMBERS INSTITUTE of WIRELESS TELEGRAPHY

2046 Arch Street - - - - - - Philadelphia, Pa.

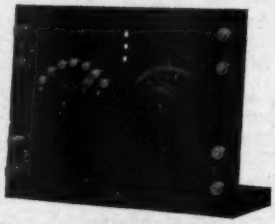
Vacuum Tube Control Unit

Type MW

Adapted to any modern hook-up. Best appearing and highest type Vacuum Control Unit at the price in the market.

Grained formica panel, 5½"x6¾", lettered in white, graduated rheostat dial, variable plate control. Tube socket (standard 4 prong).

Grid condenser and leak mounted in back of panel and so wired that it can be adapted to any modern hook-up.



PRICE $10

Parcel post prepaid in U.S.A. Immediate shipment.

WRITE for descriptive Booklet MW. Sent free on request.

THE MIDWEST RADIO CO., Dept. C. 3423 Dury Ave. CINCINNATI, O

Do you want to save a dollar on a six dollar product? Write us and see how.

We can supply for a short time only, 2-Filament Audiotrons at $5.00.

WHITALL ELECTRIC CO.

42 MAIN STREET, WESTERLY, RHODE ISLAND

Call Letters—1IAP

1 pound-degree Fahrenheit=778 ft. lbs. for water

If then we dissipate power at the rate of 778 ft.lbs. per minute the temperature of 1 lb. of water will rise at the rate of 1° F. per minute. Therefore, 1 watt, or its equivalent 44.2 ft.-lbs. per minute will raise the temperature of 1 lb. of water a proportionate amount of 1° F., that is it will raise it

$$\frac{44.2}{778} \times 1° \text{F. per min.} = 0.057° \text{F. per min.}$$

Therefore a loss of 1 watt per lb. of water produces a rate of rise of temperature of 0.057° F. per minute.

Now the specific heat of iron is 0.111 or 1/9 of water. This means that it takes 9 times more heat to raise 1 lb. of water 1° F. per minute than is necessary to raise 1 lb. of iron 1° F. per minute, or a given amount of heat will produce 9 times the temperature rise in 1 lb. of iron than it does in 1 lb. of water.

1 watt per lb. gives a rate of 0.057° F. per minute for water.

For iron 1 watt per lb. will produce 9 times the rise or $9 \times 0.057° = 0.52°$ F. per minute.

We know now that a loss of 1 watt per lb. of iron will raise its temperature at the rate of 0.52°. We are now prepared to calculate the loss in our transformer.

The weight of the 5 k.w. transformer was 48 lbs.

From the curve we find that the temperature of the iron rises 35° in the first 10 minutes, making a rate of rise of 3.5° F. per minute. From the preceding preliminary calculation we know that 1 watt per lb. produces a rise of 0.52° F. per minute. Therefore, to produce a rise of 3.5° F. will require

$$\frac{3.5°}{0.52°} = 6.6 \text{ watts per lb. loss in iron}$$

Algebraically this is as follows:

1 watt per lb. gives A° F. per min. rise

X watts per lb. gives B° F. per min. rise

$$\frac{X \text{ watts}}{1 \text{ watt}} = \frac{B°}{A°}$$

$$X \text{ watts per lb.} = \frac{B°}{A°}$$

This gives us the loss per lb. in the iron, which turns out to be as above 6.6 watts per lb. The weights of the iron being 48 lbs. the total iron loss is

$$48 \times 6.6 = 316.8 \text{ watts.}$$

A similar procedure is followed for the copper loss. The method is simple, the calculations easy and the apparatus required a minimum. The results check up with meter measurements very favorably.

Specify No. 766, Eveready Wireless Station Battery. Standardized for use in the U. S. Navy

Specify No. 763, Eveready Airplane Wireless Battery. Standardized for use in the U. S. Signal Corps Aviation Section

Hitch your outfit to an Eveready Battery

THE Eveready Vacuum Tube Plate Battery is the ideal battery for your wireless receiving set.

Standardized for U. S. Government use, Eveready inevitably possesses the very qualities you need for effective working of your own apparatus:

1. Thoroughly moisture proof.
2. Correct and sustained voltage.
3. Suspended action while not in use.
4. Light and compact.
5. Low in cost.

As regards sensitiveness, no receiving set is to be considered as merely "amateur"—it either receives or it doesn't.

The high efficiency of the Eveready Battery will increase the effectiveness of your apparatus amazingly; will stimulate your interest and enjoyment in your work; and will insure your operating along professional standards.

Go to your dealer today for a new Eveready Vacuum Tube Plate Battery.

AMERICAN EVER READY WORKS
of National Carbon Company, Inc.
200 Thompson Avenue, Long Island City, New York
Chicago Atlanta San Francisco

EVEREADY

VACUUM TUBE PLATE BATTERIES FLASHLIGHTS AND BATTERIES

No. 2659

Eveready Flashlight for wireless operators

A-20-TE

TEL. BACK BAY 5964

899 BOYLSTON ST.
BOSTON, MASS.

WIRELESS.

Learn Wireless at the Oldest, Largest and Best Equipped radio school in New England. Successful graduates of the EASTERN RADIO INSTITUTE are found in responsible radio positions all over the world! Why not be one? Our illustrated prospectus is free. Send for one.

F. D. PITTS, Director.

INTRODUCING THE DUBILIER UNIVERSAL CONDENSER

TYPE No. 577 — PRICE $2.00

Suitable for Transmission and Reception. Will handle 100 watts of C. W. Energy.

THE DUBILIER UNIVERSAL CONDENSER is the first condenser especially designed for low power continuous wave transmitters which will also prove suitable for reception work. This condenser is made of the finest clear India Mica. Its capacity is absolutely constant and is so maintained by special spring clamps which slide on the pressure plates. This unique construction permits an extremely compact unit and the losses are so small as to be unmeasurable. They are tested at 1500 volts and rated at 1000 volts so that they can be used on C. W. sets up to and including 100 watts.

The No. 577 DUBILIER UNIVERSAL CONDENSER can be supplied in practically all capacities at $2.00 each.

Bulletin D-2 Describing the DUBILIER UNIVERSAL CONDENSER, together with literature describing other high grade apparatus will be sent you on receipt of five cents in stamps. DEALERS—Write immediately for our liberal discounts.

SOLE DISTRIBUTORS FOR
Wicony's Complete Line of "Eventual" Apparatus.

Duo-Lateral Coils — Pacent Plugs — Sullivan Apparatus
Standard VT Batteries — Dubilier Condensers — Rawson Instruments
Seibt Condensers — Special Distributors for Brandes Phones — Solenoids & Magnets

PACENT ELECTRIC COMPANY, Inc.
Louis Gerard Pacent, President
150 Nassau Street — Telephone Beekman 5810 — New York City

RADIO AND MODEL ENGINEERING

Edited by M. B. SLEEPER

A Bulletin of designs and data for the Radio Experimenter of average means and shop equipment.
Out on the first of each month.
Send twenty-five cents for the May, June and July issues.

Published by
The General Apparatus Co., Inc.
570-D West 184th St. - New York

Listen and Learn

The Continental Code

Marconi-Victor Records

6 Double faced Records.
12 Lessons.

Everything from alphabet to code words. Actual receiving

WIRELESS PRESS, Inc.
326 Bdway, New York.
$6.00 Per Set

(*Continued from Page 26*)

His aerial consists of 7 strands of No. 20 phosphor bronze wire three feet apart. It is 60 feet high at one end and 70 at the other. The length is over 70 feet. There is a lead-in 12 feet long. A gas and water radiator, several rolls of chicken wire, and a quantity of lead piping is buried in the ground under the antenna.

Seefred's letter, which follows, gives a good idea of his sending apparatus, and also of the conditions that confront the coast amateurs:

Mr. H. D. Selvage,

Dear Sir:

Your letter of January 4th was received today concerning the reception of my signals, heard at your station 2KF. The call letters which you heard me call, the wave length the time and date (January 4th at 2:55 a. m. EST, which would be about 11.55 p. m. on January 3rd, Western time) is O.K. after referring to my log book.

I have heard and worked 6GF, 6GO, and 6AK several times, but that night I, troubled with "ORM" from steady buzz caused by high tension, leakage, was unable to hear much, except the above mentioned ones and others around San Francisco, who are strong here. As this buzz was in, I was only on the job a short period and then went to bed. We are also troubled with "QRM" from NPX arc and spark only eight miles away. But when all of this is out we are able to hear quite a distance. Have heard two (5) stations, eight (7) stations and a large number in the sixth district.

Have been heard by KDU (Juneau, Alaska) to the north; Honolulu, Hawaii, to the west; a ship 650 miles to the south and 9 ME (Fort Wayne, Indiana) to the east. (Your reception of my sigs will break all my former records and also to the east.)

At present I am using one stage of amplification (expect to have two stage soon) in connection with a home-made barometer type regenerative receiver and Baldwin phones.

Starting January 1st, I am now using ¾ kw. On New Year's day we put in a new ground system composed of four wires—six strands of No. 9 galvanized iron wire 40 feet wide and 70 feet long—all wires connected at the ends, also to the water pipe and other ground wires, also wire fence around

THE RADIO MAGNAVOX

GETS THE WEAK SIGNALS ALSO

In spite of the fact that the Radio Magnavox will give greater signal volume, when used with suitable amplifiers, than any other known receiver—it brings in the weak ones also.

Try hooking it up to your set with a small rheostat in the field circuit. Use weak field for most all signals, and save full field current for those signals which you wish very loud, or for reading weak ones. Both strong and weak, all the sigs you ever hear, are there.

Get a Radio Magnavox from your dealer or send us $45 and his name. Prompt shipment.

DEALERS—Write to us for proposition on the $45 RADIO MAGNAVOX

THE MAGNAVOX CO.
Oakland, Cal.

LEARN WIRELESS AT HOME

The Demand for Good Wireless Operators Far Exceeds The Supply

The N. Y. Wireless Institute will make you an operator—AT HOME—in your spare time—quickly, easily and thoroughly. No previous training or experience required. Our Home Study Course was prepared by L. R. Krumm, formerly Chief Radio Inspector, Bureau of Navigation, New York. Our experts are able to impart their practical and technical knowledge to *YOU* in an *easy to understand* way—will direct your entire course. The graded lessons mailed you will prove so fascinating that you will be eager for the next one. The instruments furnished *free*, will make it as easy to learn the Code as it was to learn to talk. *All you will have to do*, is to listen.

BIG SALARIES

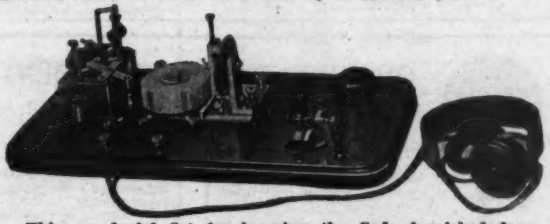
Wireless operators receive excellent salaries ranging from $125 to $200 a month and it is only a stepping stone to better positions. There is practically no limit to your earning power. Men who but yesterday were Wireless Operators are now holding position as Radio Engineers, Radio Inspectors, Radio Salesmen at salaries up to $5000 a year.

Travel The World Over

A Wireless Operator can visit all parts of the world and receive fine pay and maintenance at the same time. Do you prefer a steady position without travel? There are many opportunities at the numerous land stations or with the Commercial Wireless or with the Steamship Companies.

FREE Instruments and Text Books

We furnish free to all students, during the course, *the wonderful receiving and sending set exactly as produced in the illustration*. This set is not loaned but *given* to all students completing the Course.
The Transmitter shown is the celebrated *Omnigraph* used by several Departments of the U. S. Government and by the leading Universities, Colleges, Technical and Telegraph Schools throughout the U. S. and Canada. Start the *Omnigraph*, place the phone to your ear and this remarkable invention will send you Wireless Messages, the same as though you were receiving them through the air, from a Wireless Station hundreds of miles away.
When you apply for your license, the U. S. Government will test you with the *Omnigraph*—the same model *Omnigraph* as we furnish to our students. Ask any U. S. Radio Inspector to verify this.



This wonderful Set for learning the Code furnished free with our Course

FREE Post-Graduate Course

A one month's Post-Graduate Course, if you so desire, at one of the largest Wireless Schools in N. Y. City. New York—the Wonder City—the largest port in the World and the Headquarters of every leading Wireless and Steamship Company.

Easy Payments

A small payment down will enroll you. We will make the payments so easy that anyone ambitious to enter the fastest growing profession—Wireless—may do so.

Send for FREE Booklet

Without obligating you in any way, send for our booklet "How to become an Expert Wireless Operator"—it is free. Mail the coupon attached, or postal or letter—*but do it to-day.*

THE N. Y. WIRELESS INSTITUTE
Dept. 301, 258 Broadway, - - New York City

Send me free of charge, your booklet "How to become an Expert Wireless Operator," containing full particulars of your Course including your *Free Instrument offer.*

Name .....

Address .....

City or Town ..... State .....

HOT WIRE AMMETERS

We have on hand a large stock of Roller-Smith Type TAW Hot Wire Ammeters, with ranges of 0-1, 0-2.5, 0-5 amperes.

We are offering these at the remarkably low price of $6.50 each, postpaid.

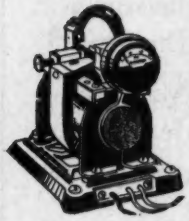
Send 10c in stamps for our catalogue.

The Radio Electric Company

3807 Fifth Ave., W. Pittsburgh, Penna.

10c CHARGES YOUR BATTERY AT HOME WITH AN F-F BATTERY BOOSTER

and your Wireless Station will never be closed because of a discharged battery. Is it not gratifying to feel that your filament battery will always be ready when you want it and that you will never have to give up in disgust when working a distant Station? A fully charged battery is better, lasts longer and everything depending upon the batter works better. F-F Battery Boosters charge automatically and operate unattended. Screw the Plug into a lamp socket, snap clips on battery terminals and see the gravity come up. The Ammeter shows you just the amount of current flowing. Adjustable carbon electrodes rectify the current and last for thousands of Hours.



Everything is complete in one compact, self-contained unit. The F-F Booster is a Magnetic Rectifier for 105-125 Volt 60 Cycle Alternating Current. 1921 Types with Net Prices.

Bantam Type 6 charges 6 volt Battery at 6 Amps. $15
Type 16 charges 6 Volt Battery at 8 Amperes $24
Type 166 charges 6 Volt Battery at 12 Amperes $32
Bantam Type 12 charges 12V. Battery at 5Amps. $15
Type 112 charges 12 Volt Battery at 6 Amps. $24
Type 1612 charges 12 Volt Battery at 7 Amps. $32
Type 1626 charges both 6 Volt and 12 Volt Batteries in combination, at 12 and 7 Amperes $48

The larger and higher ampere charging rate Types are recommended for large batteries, or where time is limited. Shipping Weights Complete with AMMETER and BATTERY CLIPS, 11 to 15 Pounds.

Order from your dealer, or send check for prompt Express shipment. If via Parcel Post have remittance include Postage and Insurance Charges, or have us ship C. O. D.

SERVICE STATION SERVICE, IN YOUR OWN GARAGE

A Booster Insures Quick and Sure Starting in all seasons. To charge Auto Battery, screw plug in lamp socket in garage, snap charging clips on battery terminals without disconnecting or removing battery from car, turn switch and lock garage door, knowing your battery will be charged in morning. Keeping your Starting Storage Battery in charged condition makes it delightfully responsive and last so much longer, requiring fewer expensive battery renewals, that it actually costs you less to buy a Booster than to be without one, for they save more than they cost. Other F-F Battery Boosters charge batteries from Farm Lighting Plants, Direct Current Circuit and Direct Current Generators.

Battery Charging Stations and Garages Use Our Large F-F Rotary Rectifiers for Group Charging. Write Today for Free BOOSTER Bulletin No.34, or ROTARY Bulletin 34A; or Mail Check with Order.

The FRANCE MFG. CO. Office and Works CLEVELAND, OHIO

QUALITY RADIO EQUIPMENT

$45.00

Radio Magnavox Type R-3

Latest development in sound amplifiers; constructed on a patent protected electro-dynamic principle. Emits same volume of sound as higher priced Magnavox Telemegafone.

Radiotron U. V. 202

New type Power Tube of improved operating characteristics. Provides long operating life. Rated at 5 Watts. Filament Voltage 7.5 V. Filament current 2.35 amps. Plate voltage, 350-400 V.

$5.00 (postage extra)

Thordarson Type R 1 K.W. Transformer reduced from $40.00 because of overstock to $35

Full supply of quality Vacuum Tubes, Controls and parts. Special Dealer's offer. Mail orders filled promptly. Write for Radio Catalogue No. 2.

DOUBLEDAY-HILL ELECTRIC CO.

715 Twelfth St., N. W. Washington, D. C. Radio Dept., Desk C 719-21 Liberty Ave., Pittsburgh, Pa.

yard. All of this is under the antenna.

My spark note is medium between high and low; approximate wave length is between 200 and 225 meters. Tunes fairly sharp. Using 6-inch coupling on O. T., radiation is over 5 amps (only have a 5 amp. hot-wire meter and I run it off the scale).

Have been heard in twenty states (including your state) also Alaska, Canada, British Columbia, Hawaii, off Mexico and at sea.

All my apparatus is home-made.

I want to congratulate you on your very excellent receiver.

Please listen for me again, and let me know by mail.

Thanking you many times, I am,

Very truly yours,
H. C. SEEFRED.

(Radio 6EA)

Gorden Bennett's letter says in part:

My sending set is as follows 1 kw. Clapp Eastham transformer 1200 volts secondary. The gap is the latest thing in rotary quench gaps which are built in the shops with an oil condenser. The pole is an eighty foot stick with vertical antenna.

The receiving set is a regenerative two-step amplifier using Western Electric bulbs and Baldwin phones. Until now my sending range is about 1,000 miles. I have been heard in Boise, Idaho and Phoenix, Arizona. In your next letter I wish you would let me know about the number of 6 stations that you fellows hear back there in New York. You spoke about 6EA and 6ZE. Both these fellows have fine sets and have my records beat so far. 6ZE is assistant radio inspector in San Francisco.

The great trouble around this coast is that the QRM is fierce right now. At 6 p. m. there are at least ten fellows within five miles from here trying to work at the same time, but later in the evening it is fine going.

* * * * * * *

While a very creditable piece of work, this is not the first time that amateur transmission has been heard across the continent. Early in 1917, 2PM station, located on West End avenue, New York City, was copied by amateurs on the Pacific Coast, and the record was verified. The input at 2PM at the time was about 750 watts. A synchronous discharger was employed and the transmission took place on 200 meters.—Ed.

The Monthly Service Bulletin of the

National Amateur Wireless Association

Guglielmo Marconi, *President* — J. Andrew White, *Acting President* — H. L. Welker, *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

NATIONAL ADVISORY BOARD OF VICE-PRESIDENTS

Prof. A. E. Kennelly, *Harvard University.*
Maj. Gen. George O. Squier, *Chief Signal Officer, U. S. Army.*
Captain D. W. Todd, *U. S. N., Director Naval Communications.*
Rear Admiral W. H. G. Bullard, *U. S. N.*
Prof. Alfred N. Goldsmith, *College of the City of New York.*
Major William H. Elliott, *American Guard.*
E. E. Bucher, *Instructing Engineer.*
Prof. Samuel Sheldon, *Brooklyn Polytechnic Institute.*
Colonel Samuel Reber, *Signal Corps, U. S. Army.*
Prof. Charles R. Cross, *Massachusetts Institute of Technology.*

Headquarters, 326 Broadway, New York

Another Convention Planned

THE Executive Radio Council, Second District, at a regular meeting held on April 6, at the Seamen's Church Institute, New York, decided to hold its second annual convention and exhibition at the Pennsylvania Hotel, New York, during the week of March 6 to 11, 1922.

The Convention Committee made its final report at this meeting on this year's exhibition and convention and was discharged from further activities and disbanded. A cash balance of $589.09 was transferred to the credit of the Council as the net proceeds of the exhibition.

An interesting address on "Radio Tubes" was given in the lecture room of the Deborah Cook Sayles Public Library, Pawtucket, R. I., by Capt. H. G. Gawler of the Radio Corporation of America. The lecture was arranged by N. B. Judkins of East Providence and R. W. Farnum, members of the Blackstone Radio Club. Amateur operators from Brown University and from all sections of the state were present to listen to the expert instruction imparted by Capt. Gawler.

The development of radio tubes for amateur and commercial usage has reached a high degree of efficiency, asserted Capt. Gawler, who gave technical instruction regarding the use of the tubes and illustrated his lecture with stereopticon slides. He also spoke of the increased interest in citizen radio work and complimented the members of the local club upon their earnestness.

Capt. Gawler was formerly government inspector for the first New England division and is an authority upon radio work. His address was followed with close attention by his audience, most of whom were local club members.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

What have you done to prolong the life of your Vacuum Tube?

Closing date, June 1, 1921

Contestants are requested to submit articles at the earliest practical date.

Prize Winning Articles Will Appear in the August Issue.

Prizes will be awarded this month on the best article explaining methods or apparatus to protect and prolong the life of vacuum tubes. This should prove a valuable contest for the amateur and experimenter. Let us hear from you.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, it's practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00, *in addition to the regular space rates paid for technical articles.*

All manuscripts should be addressed to the Contest Editor of THE WIRELESS AGE

22½ Volt Batteries for plate circuit of vacuum tubes.

Write for catalogs

NOVO MANUFACTURING CO.

424 West 33d Street, New York, N. Y. — 531 So. Dearborn St., Chicago, Ill.

Arlington Tested Crystals

For over five years the accepted standard for crystal detectors. Galena or Silicon, individually tested and packed in tin containers, postpaid, 25c. crystal. **25c**

THE NEWMAN-STERN CO.
Dept. W. A. Cleveland, O.

Red Head Receivers NOW Post Paid **$8**

3000 ohms. A triumph in Radio phone building. Amazing value. Supersensitive. Sent on ten day trial. *Write for bulletin*

The Newman-Stern Co.
Dept. W. A. Cleveland, O.

QST

A MAGAZINE DEVOTED TO AMATEUR WIRELESS

Official Organ: American Radio Relay League

New Developments, C.W. Transmission, Vacuum Tube Circuits, Regenerative Receivers, Underground and Loop Antennas, Radiotelephony, Relaying, Operating Department Work, all A.R.R.L. News, Humorous Stories by The Old Man. All these and many more are included in QST.

SPECIAL TRIAL OFFER

Regular price $2.00 per year, 20 cents per copy. Introductory rate: 7 months subscription for $1 and attached coupon.

PIN A DOLLAR BILL TO COUPON AND MAIL IT TODAY!

RETURN COUPON

American Radio Relay League,
Hartford, Conn.

Enclosed find $1; please enter my trial subscription to QST for 7 months.

Name_____

Address_____

Introducing The Pacent Universal Plug

NO CONNECTIONS TO SOLDER

PRICE $2.00

Patent applied for.

THE ONLY PLUG DESIGNED FOR RADIO WORK

THE PACENT UNIVERSAL PLUG, now obtainable from your dealer, is the plug for which you have been waiting. It consists of three parts; two moulded bakelite pieces, each with a recessed finger grip, and the plug with its connecting spring clips. The two moulded pieces are held together with a single screw which fits into a threaded brass insert.

In addition to telephone headset work, the PACENT UNIVERSAL PLUG may be used very effectively for "plugging in" a microphone transmitter, manipulating key, a loading inductance, the search coil of a wavemeter, a remote control switch, a plate battery or high voltage generator, in fact its adaptability renders its name synonymous with its uses.

The effective and practical design of the PACENT UNIVERSAL PLUG was so appreciated by the United States Navy Department, that the plug was officially approved and a most gratifying letter was received from the Navy Department commending its many desirable features.

No. 50—PACENT UNIVERSAL PLUG. Price, $2.00.

Bulletin P 11 describing the PACENT UNIVERSAL PLUG and literature describing other unique apparatus will be sent you on receipt of five cents in stamps.

DEALERS—Write immediately for our liberal discounts.

SOLE DISTRIBUTORS FOR
Wiconi's Complete Line of "Eventual" Apparatus.

Duo-Lateral Coils
Standard VT Batteries
Selbt Condensers
Pacent Plugs
Dubilier Condensers
Special Distributors for Brandes Phones
Sullivan Apparatus
Rawson Instruments
Solenoids & Magnets

Pacent Electric Company, Inc.

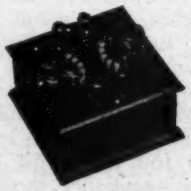
Louis Gerard Pacent, President
150 Nassau Street Telephone Beekman 5810 New York City

NEW INVENTION—RADIO APPARATUS

Damped and Undamped Waves
Write for Literature

Mignon System Mfg. Co.
BUFFALO, N. Y. U. S. A.

Hook 'er To Yer Bulb



The most wonderful tuner in the world for only $10.00
Last month this tuner beat in a test one of the NAVY STANDARDS at Ketchikan, Alaska.

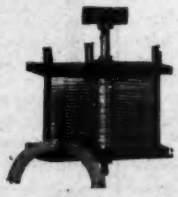
10 Captains of Ocean-going ships have had their wireless operators install one of our tuners in the captain's cabin so the exact time by wireless can be had without using either tube, bell, or hand.

"GREAT!" says one old sea dog. "WHAT IN SAM HILL WILL YOU SMART ALECS GET UP NEXT?" European stations copied in day time and no fancy aerial is needed. A single wire about 40 long by 25 high will do the trick. London amateur W. R. Wade, Clifton, Bristol, promises report for the magazines to publish showing how the amateurs there read our "sigs" in England. Junk your funny wound coils and get a regular two-pound tuner that you can use during the static season. 20,000 meters maximum wave length. Hook up on bottom of tuner.

KNOCKED DOWN AND ASSEMBLED CONDENSERS

Which kind do you want? Made for panel mounting and are complete with scale, pointer and knob. Used all over the world now and still going strong. No C. O. D. orders. Add parcel post. Buy from your dealers and send us his name if he cannot supply you. Canadian amateurs buy from local dealers or write us for nearest dealer. Formica tops and bases. Movable plates are screwed on and not clamped.

11 plate knocked down $1.80
21 " " " 2.25
41 " " " 3.20



Send 10 Cents for 16 Page Catalogue

SOLD BY YOUR DEALER, OR

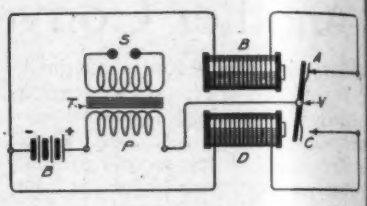
TRESCO Davenport, Iowa.

Efficient Interrupter Design

By G. N. Garrison

IT is generally conceded by engineers and by amateurs who make use of spark coils in transmitting that the higher the speed of the vibrator, within certain limits, the greater will be the efficiency of the set as a whole, other things, of course, being equal.

With this fact in mind, various manufacturers have, from time to time, designed and placed upon the market interrupters and spark coils whose interrupters were supposed to attain a speed of vibration not approached by anything then available. Indeed, the writer remembers one



Circuit of the vibrator

manufacturer who guaranteed his spark coils to produce alternating current at the "extreme" frequency of 500 cycles per second. Although this was perhaps, with difficulty attained at the time the coil was first marketed, it is easily surpassed with the circuit and double action vibrator described below.

It will be noted that the master vibrator and actuating coils in the circuit submitted form a separate unity from the transformer, T. This is made necessary by the employment of an interrupter V, whose fulcrum is at the center instead of at one end as is the general practice. For the magnets B and D, ordinary electric bell windings will be found satisfactory, while contacts A and C should be adjustable. The polarity of the battery is optional, but it must be in series with the transformer primary to be interrupted.

When the vibrator is in the position shown in the sketch, a complete circuit is formed from the positive terminal of the battery through the transformer primary, contact A and magnet B back to battery negative while the circuit B, P, C, D and B are open. This current energizes the magnet B and draws the upper end of the vibrator V toward it thus breaking contact at point A and at the same instant completing the circuit B, P, C, D, at contact C. The cycle just described is repeated through this circuit and the interrupter continues in operation until shut off.

Radio Apparatus

Distributors of Reliable Radio Apparatus to Schools, Colleges and Experimenters All Over the World!

"PITTSCO"
THE SIGN OF SERVICE
AND PROMPT DELIVERY
ALL WE ASK IS A TRIAL!

"REMEMBER"
WHEN YOU SAY
"PITTSCO" YOU THINK
OF EVERYTHING IN RADIO!

Amplifying Transformers

Amrad unmounted $5.00
Amrad mounted 7.00
No. Z-7392 Clapp Eastham unmounted 4.00
No. Z-7392A Clapp Eastham mounted 6.50
No. 226-W Federal, mounted 7.50

Audion Control Panels

No. RORA Grebe in cabinet with hinged cover, splendid value... $12.50
No. RORH Grebe in cabinet with tickler connections 17.00
Amrad, Type A, in cabinet..... 15.00
No. ZRD Clapp Eastham 12.00
No. Y-1 Acme in cabinet..... 10.00
No. P-1 Paragon, "Adams Morgan" special moulded, very compact 6.00

"B" Batteries

No. 7623 Standard 22.5 V small.... $1.50
No. 7625 Standard 22.5 V large.... 2.65
No. 7650 Standard 22.5 V variable.. 3.50
No. 763 Eveready 22.5 V small 2.25
No. 766 Eveready 22.5 V large 3.50

Condensers (Vernier De Forest)

No. CV-1010 .001 without vernier in glass case $17.50
No. CV-1013 .001 with vernier in glass case 19.50
No. CV-1500 .0015 unmounted without vernier attachment 13.95
No. CV-1510 .0015 without vernier in glass case..... 18.95
No. CV-1513 .0015 with vernier in glass case 20.60

Note—Any of the above vernier condensers are admirably adapted for radiophone work.

Condensers (Variable)

No. C-1 Connecticut .001 Mfd. mounted $6.50
No. C-2 Connecticut .001 Mfd. panel mounting 6.50
No. 1 Chelsea .0012 Mfd. mounted .. 5.00
No. 2 Chelsea .0012 Mfd. unmounted 4.75
No. 3 Chelsea .0006 Mfd. mounted.. 4.50
No. 4 Chelsea .0006 Mfd. unmounted 4.25
No. 5 Chelsea dial ¼" or ⅜" shaft 180°, pure bakelite 1.00

Condensers (Fixed mica type)

No. ROCC Grebe .0002 Mfd..... $1.00
No. ROCD Grebe .0005 Mfd..... 1.20
No. ROCE Grebe .001 Mfd..... 1.60
No. ROCF Grebe .005 Mfd..... 3.80
No. ROCA Grebe .0002 Mfd. and .5 megohm leak 1.20
No. ROCB Grebe .0002 Mfd. and 3 megohm leak 1.20

Condensers (Low voltage)

No. ES-355 1 MF 500 Volts..... $1.25
No. ES-356 2 MF 500 Volts..... 1.25
No. 21AA Western Elec. 1 Mf. 1000 V AC 2.50

Weston Meters (Model 301)

O-100 Milli-Amps flush $8.50
O-300 Milli-Amps flush 8.50
O-500 Milli-Amps flush 8.50
O-1 Ampere flush 8.50
O-3 Ampere flush 8.50
O-5 Ampere flush 8.50
O-50 Volts flush 8.50
O-500 Volts flush 21.25

Hot Wire Meters (Flush or front Mtg)

No. 127 Gen. Radio ½ ampere.... $7.75
No. 127 Gen. Radio 1 ampere.... 7.75
No. 127 Gen. Radio 2½ ampere.... 7.75
No. 127 Gen. Radio 5 ampere.... 7.75
No. 127 Gen. Radio 10 ampere.... 7.75

Regenerative Receivers

No. CR-2 Grebe 175-680 meters.... $51.00
No. CR-3 Grebe "Relay Special" 175-680 meters 65.00
No. CR-3A Grebe with tube control 175-375 meters 45.50
No. CR-5 Grebe's "Super-special" 175-3000 meters. Tube control self contained. Ideal for jewelers 80.00
No. CR-6 Grebe 175-680 meters, Detector and two step amplifier self contained, a complete set $200.00
No. CR-7 Grebe 500-20000 meters "Long Wave special," complete set 210.00

Telephones

Baldwins Type C Navy Standard .. 16.50
Baldwins Type E "Super-Sensitive" 20.00
Baldwins Type F Very small, light 21.00
Brandes "Superiors" New Headband 8.00
Brandes "Transatlantics" New Headband 12.00
Brandes "Navy Type" New Headband 14.00
No. CW-834 Western Elec. 2200 ohms 14.00

Magnavoxes

Type R-3 Magnavox loud speaker latest model just out..... $45.00
Magnavox Radiophone hand transmitter 25.50
Magnavox Radiophone transmitter tone-arm 37.50

Vacuum Tubes

No. UV-200 Radiotron (Detector) ... $5.00
No. UV-201 Radiotron (Amplifier).. 6.50
No. UV-202 Radiotron 5 Watt Transmitter 8.00
No. UV-203 Radiotron 50 Watt transmitter 30.00
No. UV-204 Radiotron 250 Watt transmitter 110.00
(Radiotrons always in stock. Send US your orders)

Transformers (Transmitting)

No. P-1 Thordarson 250 Watt Type "R" $14.00
No. P-2 Thordarson 500 Watt Type "R" 22.00
No. F-1 Acme 500 Watt with bakelite panel completely mounted. 30.00

Condensers (Transmitting Dubilier)

No. D-100 250W, 10000 V, .007 Mf. $19.00
No. D-101 500W, 14000 V, .007 Mf. 30.00
No. D-102 1000W, 21000 V, .007 Mf. 45.00
No. D-103 1000W, 25000 V, .007 Mf. 50.00

Rotary Gaps

No. 443 Murdock 4000 RPM $18.50
No. 124 Klitzen Latest Model 25.00
No. B-1 Benwood, Bakelite model.. 25.00

Rotors

No. 443 Murdock, ⅞, ¼ or ⅜" shaft. $3.00
No. T-1 Thordarson, 8 or 16 point.. 5.00
No. B-1 Benwood, Original 8, 10 or 14 point 8.00
No. H-1 Hyrad, 10 point, 9ZN type. 9.95

Oscillation Transformers

No. T-1 Thordarson "Special" $10.00
No. TXL-100A International, Ideal for ½ K.W. sets, splendid value 14.95
No. Z-652 Clapp Eastham, large, 1 K. W. size, very efficient 17.50

C. W. Inductances (Phone Work)

Type 181 Tuska $7.50
Type 181 Tuska knockdown 5.00
Type 182 Tuska (magnetic type) .. 10.00
Type 183 Tuska (Tickler type) 12.50
Type 170 Tuska Filter 16.00

C. W. Transformers (Phone Work)

Acme 200 Watt mounted $20.00
Acme 200 Watt unmounted 16.00
Acme 50 Watt mounted 15.00
Acme 50 Watt unmounted 12.00

Choke Coils (Phone Work)

Acme 1½ Henry 500 MA double coil. $8.00
Acme 1½ Henry 500 MA single coil. 6.00
Acme 1½ Henry 150 MA double coil. 6.00
Acme 1½ Henry 150 MA single coil. 4.00

Resistances (Phone Work)

No. 1 Ward Leonard 5000 ohms.... $2.25
No. 2 Ward Leonard 10000 ohms... 3.50

Telephone Transmitters

No. 329-W Western Electric $4.25
No. 5175-A Connecticut 4.25
No. 5176-A Connecticut with short adj. arm 5.25

Variometers

No. M-1 Murdock, complete with knob, dial and panel $7.50
No. M-2 Murdock, Vario-coupler complete with knob, dial and panel. 8.50
No. ZRV Clapp-Eastham Variometer complete with dial 6.50
No. ZRU Clapp-Eastham Vario-coupler, complete with dial 7.50

"Let 'PITTSCO' products, super-service and delivery solve your Radio problems"

SEND US YOUR ORDERS TODAY!

Send ten cents in stamps for Catalog No. 22. Over 100 pages, over 150 illustrations, over 600 items.

"PITTSCO" SERVICE REACHES ALL OVER THE WORLD! WHY NOT LET IT REACH YOU!

F. D. Pitts Co., Inc.

12 Park Square Dept. B Boston, Mass., U. S. A.

Maximum Receiving Satisfaction Assured

To get maximum results in vacuum tube reception the headset must have an impedance approximating that of the V. T. The Navy Type N. H. I. is designed for this purpose. It has an impedence of 50,000 ohms at 800 cycles—over twice that of any other headset.

"Navy Type"—50,000 ohms A. C., weight 9 oz., complete with head band and polarity indicating cord. Price, $14.00.

BRANDES MATCHED TONE HEADSETS

100 Per Cent Receiver Satisfaction

HIGH PITCH

The highest-pitched notes can be heard with the Navy Type N. H. I. It allows reception at a pitch which makes interference negligible. The Navy Type N.H.I. will respond clearly to a wider range of frequencies than any other headset, and yet be superior in audibility.

POLARITY

To keep the sensitiveness from being impaired by the demagnetization of the permanent magnets, the D.C. must pass through the receiver in the proper direction; this is provided for by the marked conducting cord, with which the Navy Type N.H.I. is equipped.

It is of the utmost importance for both telephones to be so matched in tone that they emit **exactly** the same note. Nothing is so apt to hamper the reception of weak signals, especially through interference, as badly matched telephones. The Navy Type N.H.I., being a "Brandes" product, is, of course, carefully matched in tone.

TRIAL OFFER

Send $14 for a Navy Type Headset. Try it for 10 days. If you don't find it the best headset you ever tried and are not entirely satisfied with it, send it back and your money will be refunded promptly.

ALSO MAKERS OF

Trans-Atlantic Headsets. 25,000 ohms, A. C. $12.00
Superior Headsets. 2,000 ohms, D. C. ..... $ 8.00

Send 5c for Catalog W.

C. BRANDES, Inc.
Room 818, 32 Union Sq., New York

Pacific Coast Distributors
LEO J. MEYBERG CO.
428 Market St.
San Francisco, Cal.

If you have anything to sell try the Classified Section of THE WIRELESS AGE

WHAT YOU GET——

Vacuum Tubes that operate at low cost,

A supersensitive detector	U.V. 200	$5.00
A high vacuum tube amplifier	U.V. 201	6.50
A 5 watt tube transmitter	U.V. 202	8.00
A 50 watt tube transmitter	U.V. 203	30.00
A 250 watt tube transmitter	U.V. 204	110.00

Accessories made especially for use with our tubes and valuable information on the operation of these tubes

From——

INDEPENDENT RADIO SUPPLY CO.

3716 DOUGLAS BLVD. CHICAGO, ILL.

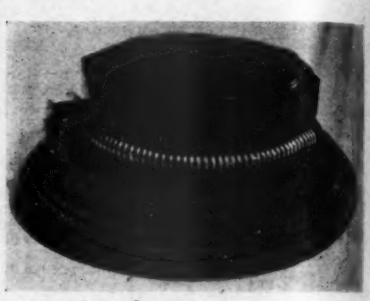
"Better results with less effort"

With a little careful construction on the part of the experimenter it is easily possible to build a vibrator that will interrupt the current at least 1,000 times per second thus producing that high, musical note so much desired.

Low Cost, Sturdy and Efficient Rheostats

By R. U. CLARK, 3RD

SOME experimenters consider a rheostat too small an item to make them from spare parts, which happens to be on hand, but those who are interested in apparatus making will find the very simple rheostat described here both neat and efficient.



View of the rheostat completely assembled

The base can be made from most anything workable in the line of insulating materials, an old round wooden switch base being used in the instrument shown here. The binding posts used are rather novel, being nothing more than two cheap metal spring clips with saw tooth jaws, one being so mounted that the springy part of it makes contact with the wire resistance coil.

The mainstay of the rheostat proper is a cheap radiator cap, which can be bought in various sizes very cheaply. This cap is fitted with a short shaft, threaded or soldered to the central portion of the metal case which has a small hole for attaching the wire resistance coil.

The resistance coil can be wound from any high grade wire or in many cases can be recovered from a burnt out nitrogen lamp of the largest size, or an old heating unit of some kind. As remarked before, one end of this coil is grounded to the metal part of the radiator cap, which in turn is connected to one of the binding posts by contact with the edge. The remainder of the coil is then wound around the metal casing of the cap, a small piece of tape, asbestos, or similar material being placed between the coil and the casing to prevent short circuiting. The coil ends are joined with string.

A view of the complete instrument is given here, the cost of material being about fifteen cents in all, and the time required to make it but a few minutes, and it will last for years.

Queries Answered

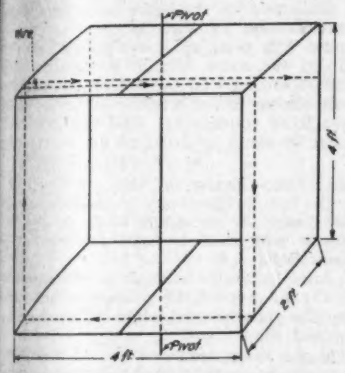
Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively No Questions Answered by Mail.

A. S. O., Fort Dodge, Iowa:—

Q. 1. *In the December, 1920, issue of* THE WIRELESS AGE *on page 8, a short article was given on "Resonance Wave Coils to Replace Aerials." I would like to have complete details as I wish to construct one. Please give the size of wire, dimensions, etc.*

Ans. 1. To construct a "resonance wave coil" more commonly called a loop antenna, construct a box frame four feet on a side and 24 inches wide. Wind on it 20 turns of No. 18 bell wire. Arrange the coil so that it can be rotated and then connect a large capacity variable condenser so that it can be connected either in series or parallel with the loop. Employ the loop as if it were the secondary of an oscillation transformer and connect the detector with it accordingly. Below is a sketch of the frame.



Wind wire on the frame as in the sketch. For more complete details and operating data refer you to the latest edition of Robinson's Navy Manual.

* * *

A. C. R., White Rock, S. D.

Q. 1. *What is the wave length of an aerial containing four wires each 50 feet long?*

Ans. 1. Insufficient data to estimate. Give length of lead-in, distance between wires, height above ground and length of ground lead.

Q. 2. *Please tell me of some company which manufactures wireless apparatus to order.*

Ans. 2. Suggest you communicate with several of the more prominent manufacturers advertising in THE WIRELESS AGE. The Klitzen Radio Manufacturing Co., of Racine, Wisconsin, advertise that they will build special apparatus to order.

* * *

D. O. S., Le Mars, Iowa.

Q. 1. *Could you tell me where I could find the meaning of abbreviations used in wireless messages? I don't mean standard abbreviations such as "QSA," but abbreviations for words such as "CUL."*

Ans. 1. These abbreviations are the well known Philips abbreviation code. Any telegraph operator can give you the complete list. The Wireless Press, 326 Broadway, New York, will probably be able to sell you this code in book form.

PRICE	UV200 $5.00	UV201 $6.50	UV202 $8.00	UV203 $30.00	UV204 $110.00
Dimensions (Overall)	1¾"x4⅛"	1¾"x4⅛"	2⅛"x5"	2"x7½"	5"x14½"
Base	4 Prong Standard	4 Prong Standard	4 Prong Standard	4 Prong Special	Special Mounting
Voltage of Filament Source	6V.	6V.	10V.	12V.	15V.
Fil. Terminal Voltage	5 to 5.4v.	5 to 5.4v.	7.5V.	10V.	12V.
Filament Current	1.1 Amp.	1 Amp.	2.35 Amp.	6.5 Amp.	15 Amp.
Plate Current			.045 Amp.	.15 Amp.	.25 Amp.
Output Impedance	10,000 ohms	21000@40v. 14000@100v.	5000 ohms		
Amplification Constant	7	8	8	10	25
Watts Output			5 Normal	50 Normal	250 Normal
Plate Voltage	15- to 22.5v.	40 to 100v.	350V. Normal	1000V. Normal	2000V. Normal

CUT OUT THIS—

For your note book. Place your orders with us—you'll like our service.

See our ad. on Page 28

Complete stock of Acme, Adams-Morgan, Chelsea, General Radio, Grebe, Radio Service, Radio Corp., Federal, Western Electric Products and Sorala Radiofone Specialties.

SOMERVILLE RADIO LAB.
Winter Hill, 45, Mass.

A C E E

SAVE THAT DOLLAR

You intend spending for a grid leak. Buy the "Ace" Vacuum Tube Socket complete with Grid Leak mounted on base.

Ace V. T. Socket with grid leak $1.50
Ace V. T. 4 tube socket mounting for C. W. Units 6.00
Ace V. T. Die Casting only, without base ..... .55

Specify whether panel or table type is desired. If your dealer cannot supply you, order direct from us. Dealers solicited. Mail orders given prompt attention.

Send 3 cents in stamps for SPECIAL PRICE BULLETIN No. 102.

THE PRECISION EQUIPMENT CO.
Mfrs. & Distrs. of Radio Equipment
Dept. C. 2437-2439 Gilbert Ave., CINCINNATI, OHIO

"YOU MAY PAY MORE BUT YOU CAN'T BUY BETTER"
MEMBER A. R. R. L. RADIO CALL "8XB"

You can use it for 10 days FREE

This is the first book to bring the science of radio up to date—to include the wonderful developments made during the war.

RADIO ENGINEERING PRINCIPLES
BY HENRI LAUER AND HARRY L. BROWN.
304 pages, 6x9, 250 illustrations, $3.50 net, postpaid.

Major-General Squier, Chief Signal Officer of the Army, says, "I recommend it as a work which brings the study of this important subject up to date.

Use the coupon
Examine it for 10 days FREE

McGRAW-HILL BOOK CO., Inc.
370 Seventh Ave., N. Y.

FREE EXAMINATION COUPON

You may send me on approval for ten days' free examination Lauer and Brown's Radio Engineering Principles ($3.50). I agree to return the book, postpaid, in ten days or to remit for it.

Name .....
Address .....
Official Position .....
Name of Company .....

Wire 5-1-21

USE THIS PAGE FOR YOUR ORDERS

TEAR out this page. Check the instruments and quantity desired. Add up the total. Enclose check, Money order, or cash, and send it along. Please include postage charges with remittance to avoid delay. Your order will be filled at once! Request "Bulletin 14"!

ATLANTIC RADIO COMPANY, INC.
88 Broad Street, Boston, 9, Mass.

Please ship me by {Parcels Post / Freight / Express} the following items:

Quantity	Cat. No.	ITEM	Shpg. Wt.	Price
	UV-200	"Radiotron" Detector Tube @ $5.00	1 lb.	
	UV-201	"Radiotron" Amplifier Tube @..... 6.50	1 lb.	
	UV-202	"Radiotron" 5-Watt Transmitting Tube, Fil. C't.: 2.35 amp. at 7.5 v., plate voltage 350 v., @..... 8.00	1 lb.	
	"P-R"	"Paragon-Radiotron" combination detector unit complete with grid condenser, leak, rheostat, etc. @ ..11.00	1 lb.	
	T.A.W.	R.S. Hot wire ammeter (0-1, 0-2.5, 0-5A @ 5.00	1 lb.	
	ZRV	"C.E." Variometer with Dial @.... 6.50	2 lbs.	
	ZRC	"C.E." Variocoupler with Dial @.... 7.50	2 lbs.	
	ZRF	"C.E." Regenerative Receiver, 175-600 meters @ 38.00	10 lbs.	
	ARCO	Amplifying Transformer @..... 5.00	1 lb.	
	No. 1	"Chelsea" Variable Condenser .0011 mfd., mounted, @..... 5.00	1 lb.	
	No. 2	"Chelsea" Variable Condenser .0006 mfd., mounted, @..... 4.50	1 lb.	
	No. 3	"Chelsea" Variable Condenser .0011 mfd., unmounted, @..... 4.75	1 lb.	
	No. 4	"Chelsea" Variable Condenser .0006 mfd., unmounted, @..... 4.25	1 lb.	
	366	Murdock Variable Condenser .001 mfd. @ 4.75	1 lb.	
	367	Murdock Variable Condenser .001 mfd. @ 4.75	1 lb.	
	368	Murdock Variable Condenser .0005 mfd. @ 3.75	1 lb.	
	No. 5	"Radisco" "B" Battery, tapped, 22.5 v. @ 2.65	5 lbs.	
	No. 1	"Radisco" "B" Battery, untapped 22.5 v. @ 1.50	2 lbs.	
	F.C.C.	Federal Closed Circuit Telephone Jack @ ..... .85	Postage 5 cts.	
	F.O.C.	Federal Open Circuit Telephone Jack @ ..... .70		
	F.D.C.	Federal Two Circuit Telephone Jack @ 1.00		
	F.N.P.	Federal Silvered Telephone Plug @.. 2.50		
	F.B.P.	Federal Brass Telephone Plug @.... 2.00		
	66	Corwin Dial, 3 inch, at..... .75		
	67	Corwin Dial, 3 inch, with knob, @.. 1.30		
	68	Corwin Dial, 3⅞ inches, @ 1.00		
	69	Corwin Dial 3⅞ inches, with knob @ 1.70		
	344	Murdock Receiving Transformer @.. 9.00	6 lbs.	
	2	Radisco Vario-Coupler @..... 8.50	3 lbs.	
	2D	Radisco Vario-coupler @..... 9.50	3 lbs.	
	550	Murdock Tube Socket (standard) @ 1.00	1 lb.	
	156	General Radio Tube Socket (standard) 1.75	1 lb.	
		General Radio "A" Battery Potentiometer 400 ohms @ 4.00	1 lb.	
	A.M.	Paragon Rheostat, 6 ohms, @..... 1.75	1 lb.	
		Ajax Buzzer @ ..... .60	1 lb.	
		Total Price		

Name .....

Address .....

City ..... State .....

J. B., De Witts, Ill.

Q. 1. *Please furnish me, if possible, with information as to what radio companies employ Morse telegraphers in South American countries.*

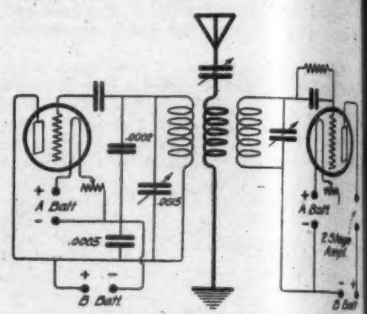
Ans. 1. Communicate with the Tropical Radio Telegraph Company, New York City. A first grade or extra first grade radio operator's license is required and Morse in addition.

* * *

A. G. C., Beaver Crossing, Neb.

Q. 1. *What is the best hook-up for a receiver using four bulbs?*

Ans. 1. Presuming that you use this in combination with a long wave tuner, would suggest that you use an external heterodyne detector, and two stages of audio frequency amplification as below.



Only two of the bulbs have been shown as the other two are in the amplifier circuit. The three coils are honeycomb coils all of the same size in a standard three coil mounting. In the heterodyne bulb circuit, shown to the left the capacities of the two fixed condensers, .0002 and .0005 mfd. must be exact in order to get best results.

* * *

C. E. M., Chester, W. Va.

Q. 1. *Is there any advantage or disadvantage in mounting tubes in any particular way, that is head down or up, or horizontal?*

Ans. 1. Bulbs should be mounted vertically to prevent the filament from touching the plate or grid when it becomes heated and sags.

Q. 2. *What kind and size of wire would be best to connect up instruments used in making up a tuner detector and three-stage amplifiers in cabinet?*

Ans. 2. Use No. 14 bare solid copper wire and the type of sleeving commonly known as "spaghetti" for best results.

* * *

R. L. B., Wadesboro, N. C.

Q. 1. *Will you please give a receiving circuit that will regenerate a phone message without making the speaker sound as though he was strangling or choking while speaking. This is how they all sound when I make my set regenerate and I have tried different ones. Spark sets are also changed when my set is made to regenerate, so if there is anything better I would like to find it?*

Ans. 1. This trouble is due to improper adjustment of your receiver. Would suggest you arrange a switch to short circuit your tickler coil as this will prevent regeneration and solve your difficulty. It is not necessary to have regeneration for the reception of phone speech or spark signals.

* * *

H. K., Sycamore, Ohio.

Q. 1. *I noticed in an electrical magazine that all amateurs are required to have a license. Could you please tell me where I could obtain a license?*

Ans. 1. A license is only required when using a transmitter and can be obtained from the radio inspector of your district at Cleveland.

A. E. D., Springfield, Ill.

Q. 1. *I am thinking of putting up a wireless telephone transmitting and receiving outfit to send a distance of ten miles and I would like you to tell me if it is required by law to get a license for a wireless transmitting outfit.*

Ans. 1. A license is required for a transmitter of any type whatsoever. Apply to the Radio Inspector of your district.

Q. 2. *Have you a record of any wireless clubs or operators in Springfield? Could you give me a list of a few of them?*

Ans. 2. For a complete list of the various radio clubs of the United States would refer you to the "Wireless Year Book," sold by the Wireless Press, 326 Broadway, N. Y. C.

* * *

R. L., Webster Grove, Mo.

Q. 1. *Please give full diagram of the Colpitts Wireless Telephone Circuit.*

Ans. 1. For complete diagram of the Colpitt's Wireless Telephone Circuits we refer you to page 337, Volume 38 of the Proceedings of the American Institute of Electrical Engineers, dated March, 1919. We regret that space precludes the inclusion of these circuits in this column.

Q. 2. *Can a Skinderviken button which is especially adapted for radio work be used to any great advantage to transmit speech?*

Ans. 2. Yes, a Skinderviken button will be satisfactory for phone transmission.

Q. 3. *Is a fifty-foot "T" aerial four wires forty feet high suitable for transmission of radiophones?*

Ans. 3. Your aerial is of approximately the proper dimensions for 200 meter transmission.

* * *

J. F., Jr., Danville, Ill.

Q. 1. *How much wire and what size would I need to make up a suitable potentiometer for regulating "B" battery voltage. I think I should have 150 to 200 ohms. If you can tell me the approximate amount I can design the coil and arrange taps for a variable voltage?*

Ans. 1. The best and cheapest solution of your problem is to employ "B' battery having taps for different voltages. A potentiometer always runs the battery down and shortens its life considerably. A potentiometer should not be tapped, but should have a sliding contact. If you decide to use a potentiometer I suggest you secure one of the graphite rod non-inductive type, which can be purchased at a very reasonable price.

CO-OPERATIVE
RADIO BUYING

This association is rendering SERVICE and SAVING to the radio amateur. If you purchase radio equipment, send stamp for details. We supply everything of standard manufacture advertised in this magazine.

STORAGE BATTERIES:

A-1 Endurance 40 ampere hour 6 volt..... $12.50
A-3 Marko 6 volt 20-40 amp hour 14.60
A-4 Marko 6 volt 40-60 amp hour 18.00
A-5 Marko 6 volt 60 ampere Ford special 17.10
A-6 Marko 6 volt 80 ampere Ford special 21.60

Prices on batteries of any voltage or ampere hour capacity on request. The "Endurance" battery listed above is made especially for the association and cannot be equalled elsewhere.

Mutual Purchasers Association
2 Stone Street New York
Dept. A.

MESCO RADIO BUZZER

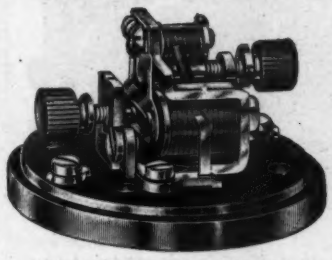


Illustration Shows Buzzer With Metal Cap Off

This buzzer maintains a constant note and is recommended as an exciter for checking wavemeters where pure note and ample energy are required.

It consists of practically a closed circuit field of low reluctance, having a steel armature to which is riveted a strap supporting a movable contact. The armature tension is adjustable by means of a screw with a milled head large enough to be easily and permanently adjusted with the fingers. The stationary contact is adjusted by means of a similar screw. The magnet coils are connected in series with a total D. C. resistance of 3.9 ohms. Shunted across these coils is a resistance having a D. C. value of 3 ohms. This shunt eliminates all sparking such as occurs at the break on ordinary radio buzzers and the energy saved thereby is transferred into any oscillating circuit connected to it, the result being that this buzzer as constructed radiates five times more energy than any other existing type. All connecting wires liable to be broken are eliminated. Contacts are of genuine platinum, which is essential in order to maintain a constant note. The parts are mounted on a Condensite base to insure constancy in operation.

This buzzer is also made to operate on a 6-volt direct current, a feature making it valuable for communication and other purposes where a 6-volt current is available. It has also been approved by the U. S. Government.

Diameter 2 in., height 1¼ in. The cap is attached to the base by a bayonet joint.

List No. Price
55 Mesco Radio Buzzer operating on 1.5V $2.50

WIRELESS MANUAL N12

You should have it even if only superficially interested. Around about you every day you read of some marvelous occurrence in which wireless played a distinguished part. It may not be entirely clear to you. The Manual will explain it. To the student of Wireless Telegraphy, the Manual contains much that is indispensable to a proper understanding of the art.

It contains 200 pages, fully illustrating and describing the many instruments used in Radio. 45 pages cover general instructions, diagrams, station calls, tables, codes and other information.

The book is printed on highly finished paper with a two-color cover and measures 9 x 5¾ inches.

Containing as it does a fund of valuable information not generally contained in a catalogue, it approaches nearer a text book in the fascinating field of wireless telegraphy. No expense has been spared to make it accurate and reliable.

No Wireless Experimenter Should be Without the Mesco Wireless Manual. We ask 25 cents (25c) for it—give you a coupon receipt which can be applied on any future order. Send your name and address now, and get one of the most complete, comprehensive and reliable wireless books published.

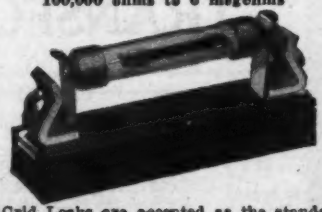
MANHATTAN ELECTRICAL SUPPLY CO. INC.

17 Park Place New York | 114 S. Wells St. Chicago | 1106 Pine St. St. Louis | 604 Mission St. San Francisco

RADIO CORPORATION
STANDARD GRID LEAKS
(24 Different Resistance Values)
100,000 ohms to 6 megohms

PRICES

Grid Leak and mounting as shown $1.25
Grid Leak Units any value ..... .75
Mounting ..... .50

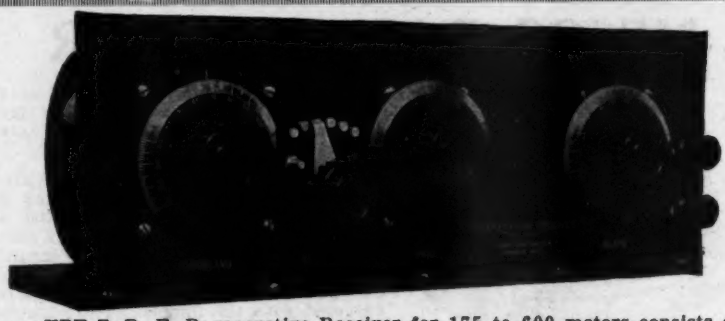


FREE

Write today for our special bulletin on the use of grid leaks in radio circuits.

The Radio Corporation's Grid Leaks are accepted as the standard of Radio Laboratories throughout the United States. Every radio experimenter using vacuum tubes for reception needs one. Permanence and reliability are the outstanding features. See your dealer or write direct to

SALES DIVISION, COMMERCIAL DEPARTMENT, SUITE 1301.
RADIO CORPORATION OF AMERICA
233 BROADWAY NEW YORK CITY



TYPE Z. R. F. Regenerative Receiver for 175 to 600 meters consists of our new Z. R. V. Variometer, a coupler of similar construction to the variometer, grid condenser and grid leak. The panel is of ¼ inch bakelite, handsomely engraved and fitted with three 3 inch dials. It measures 14¾ inches long by 5¼ inches high and exactly matches our detector and amplifier panels advertised in last month's Wireless Age.

TYPE Z. R. F. REGENERATIVE RECEIVER $38.00
TYPE Z. R. V. VARIOMETER only 6.50

Apparatus which excels in those qualities which for 13 years have maintained its enviable reputation for reliability will be found pre-eminent in the display rooms of discriminating dealers and is manufactured by

CLAPP-EASTHAM COMPANY - **161 MAIN STREET**

CAMBRIDGE, MASS.

Catalogs mailed for 6c stamp

D-L INDUCTANCE COILS 1-2 PRICE

Order Now. Best Coils Given Out First. All Are Good.
Some Slightly Shop Worn

They are unmounted, and cover the wave lengths, as follows:

D-L-25,	130-375	70c
D-L-35,	180-515	73c
D-L-50,	240-730	76c
D-L-75,	330-1030	80c
D-L-100,	450-1460	85c
D-L-150,	660-2200	90c
D-L-200,	930-2850	95c
D-L-250,	1300-4000	$1.00
D-L-300,	1550-4800	1.05
D-L-400,	2050-6300	1.13
D-L-500,	3000-8500	1.20
D-L-600,	4000-12000	1.33
D-L-750,	5000-15000	1.40
D-L-1000,	6200-19000	1.50
D-L-1250,	7000-21000	1,63
D-L-1500,	1200-25000	1.80

All parts for the amateur and anything in Radio we have

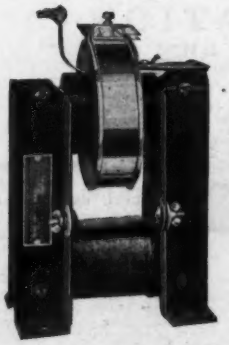
AMERICAN ELECTRO TECHNICAL APPLIANCE CO.

235 Fulton Street New York, N. Y.

Our catalogue contains 24 pages, not 84 as previously stated

An Addition to the

THORDARSON ["GOLD MEDAL"] LINE



Type "RS" TRANSFORMER

¼	K.V.A	8,000 volts	$15.00
½	"	10,000 "	20.00
1	"	15,000 "	30.00

Transformers, Oscillation Transformers, Condensers, Spark Gap Rotors

Thordarson Electric Mfg. Co.

511 South Jefferson St. CHICAGO

SMALL ADS OF BIG INTEREST

A MEETING PLACE FOR BUYERS AND SELLERS

Space in this department costs only 30 cents a line. Minimum space eight lines. Payable in advance.

WANTED—An A1 Radio Operator as head instructor in Radio School. A college graduate with some trading experience preferred. Address Box I, c-o *Wireless Age*, N. Y.

SPECIAL GARAGE MOTORS—Manufactured by the General Electric Co. 1 H. P. $78.50; 2 H. P. $110.00; 3 H. P. $128.50; 5 H. P. $166.50. All sizes both single and Polyphase Motors for immediate delivery. Special charging generators, all voltages. Write for catalog. Motor Sales Dept., 8 West End, Pittsburgh, Pa.

AUTO MOTORS SUPPLIES—Buick, Michigan, Stoddard-Dayton, E. M. F., Cadillac, Overland, Continental and Buda Motors. All types, $50.00 each and up. New Dixie Magnetos $20.00 Splitdorf High Tension Magnetos $10.00. Kellogg Pumps $3.50. Auto-Lite Generators, new, $10.00. Air Gauges 65c. Remy Ignition Coils, new, $3.00. Electric and gas headlamps, coils, distributor heads, air compressors, etc. Write for catalog. Motor Sales Dept., 8 West End, Pittsburgh, Pa.

WIRELESS—Panels 3/16" thick, 2½c square inch (Bakelite) based on even inches. Superior non-hydroscopic quick dry Insulating Varnish 35c wide mouthed bottle patent top. Little postage please. Hitone amplifying transformers $5. Super "B" batteries with taps $1.50, same larger size $2.35. Radiotron bulbs $5, $6.50 and $8.00. Novotoy Radio Shop, 5th Ave., Charlotte, N. C.

TELEGRAPHY (both Morse and Wireless) and Railway Accounting taught quickly. Tremendous demand. Big salaries. Great opportunities. Oldest and largest school; established 46 years. All expenses low—can earn large part. Catalog free. DODGE'S INSTITUTE, N. St., Valparaiso, Indiana.

HAWAIIAN AND GERMAN STATIONS READ WITH A SINGLE BULB.

Are you satisfied with your receiving set? Would you like one that will receive 6,000 miles? Would you like to build a simple one and quit experimenting? One using parts you already have and that will be the equal of any regardless of claims or price? If so get our simple diagram of a complete short and long wave receiver, 175 to 20,000 meters, with which we read Honolulu, California, South America, German, French and English stations, and practically all the high powered foreign and domestic stations, with a single bulb. Amateurs as far West as New Mexico and numerous telephone and musical concerts come in good.

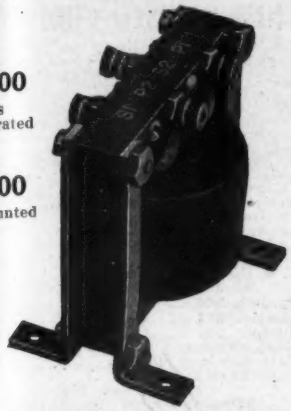
Diagram and complete instructions, leaving nothing to guess about will be promptly mailed for fifty cents in coin or stamps.

Virginia Novelty Co., Martinsburg, West Va.

"STOP! LOOK! and ACT!"

With every Radio Magnavox purchased from us we are giving absolutely free one new standard Radiotron pliotron V.T. amplifier UV201, $6.50, or one Navy Type A-P V.T. amplifier, $7.00 This Radio Magnavox is the latest development of the Magnavox Company. This new loud speaker gives forth the same volume of sound as the older model at about half the price. Signals may be heard all over the house, permitting a watch without head receivers, and with suitable amplification speech or music may be amplified to such a degree as to be loud enough for dancing. Price $45.00. This offer expires June 30. Besides this generous offer, we also furnish free with all makes of vacuum tubes, detectors, amplifiers and power tubes, the latest type of the Remler bakelite rheostat of suitable capacity or Clapp-Eastham panel mounting rheostat with enameled resistance wire wound on 1¼" bakelite form. Radiotron V.T Detector UV200, $5.00; Radiotron UV201 pliotron amplifier, $6.50; Radiotron 5-watt power tube UV202, $8.00; Radiotron UV203 50-watt power tube, $30.00; Radiotron UV250 watt power tubes, $110.00; A-P V.T Detectors, $6.00; A-P V.T. navy amplifier, $7.00; A-P transmitting tubes, $7.50. "Remember us." The Kehler Radio Laboratories, Dept. 6, Abilene, Kansas.

AMRAD
Ampliformer



$7.00 as illustrated

$5.00 unmounted

THIS amplifying transformer may cost a little more than those not so efficient, but it will give you in every instance from 25% to 50% increase in audibility of signals.

Leakage losses are avoided by special core construction eliminating lap joints. Thin laminations also contribute to greater efficiency. Look for these distinguishing points in the next transformer you buy.

In addition, the Amrad Ampliformer has a high turns ratio, and proper impedance in the primary, thus further insuring increased efficiency.

The Amrad Ampliformer is standard equipment in all the new Amrad Amplifying Units. It helps make one stage of Amrad Amplification nearly equivalent to the average two stages of amplification where ordinary amplifying transformers are used.

Bulletin S sent free on request.

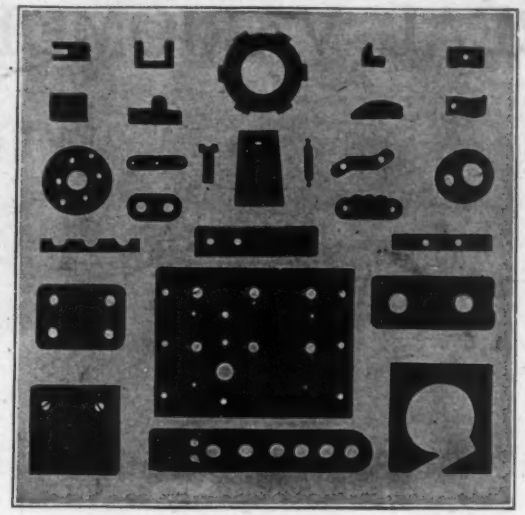
New Amrad Wavemeter Ready

An entirely new instrument is the Amrad Wavemeter Type E. It may be used as an Interference Preventer or Plate Variometer in a Receiving Set. As a Wavemeter it has a range of 175 to 340 meters. Price $13.50. Send for free descriptive Bulletin W-2.

Compete Amrad Catalog
10c stamps.

AMERICAN RADIO AND RESEARCH CORPORATION

201 College Avenue
Medford Hillside, Mass.



High Type Insulation
for Exacting Demands

IS your problem one of superior insulation? Is it one of finding a material of high dielectric strength?

Do you require a material that is tough, and strong? One that will not crack, chip, break or deteriorate with age? Must it be adaptable to bending, twisting or forming? Is easy machinability and fine finish a factor?

Diamond Fibre will do all these things and more. Or, if you must also have extreme resistance to water try Condensite-Celoron. This latter material is especially adapted to radio work.

Both Diamond Fibre and Condensite-Celoron are supplied in sheets, rods and tubes or, we can machine to specifications if desired. Write today for full data.

Diamond-F

Dept. 5

Diamond State Fibre Company,

Bridgeport (near Philadelphia) Pa.
Branch Factory and Warehouse, Chicago
Offices in principal cities
In Canada, Diamond State Fibre Co. of Canada, Ltd., Toronto

Tuska C.W. Inductance

Type 181 Unmounted

PRICE $5

Use a Tuska C. W. Inductance in your new tube set. Send your dealer's name and 5 cents for our illustrated C. W. Booklet.

THE C. D. TUSKA COMPANY
HARTFORD, 4, CONN.

"EVERYTHING IN RADIO"

WESTERN RADIO ELECTRIC COMPANY

Send for Our March
STOCK BULLETIN AND PRICE LIST
250 South Flower Street — Los Angeles, Cal.

PLATE BATTERIES
22 1-2 Volt Units

Five large size flashlight batteries soldered together with ¼ inch brass strip. Terminals of brass strip drilled for bolt and nut connections. Price $2.00, postpaid anywhere in U. S.

ECONOMY RADIO SUPPLIES CO.
232 Sanford St. East Orange, N. J.

1/4 H. P., 110 volts, A. C., 60 cycle, single phase, 1750 R. P. M. **MOTORS**

LARGE QUANTITIES NEW WASHING MACHINE MOTORS

$22.75 Each

CHAS. H. JOHNSTON - Box 8 M. E., Pittsburgh, Pa.

A REAL VARIOMETER

Patent applied for

Efficiently Designed Scientifically Correct Distributed Capacity is Nil

This instrument represents the last word in Variometer Construction. It is the result of many months of experimenting and designing, involving exhaustive tests and trials, by a well known Cleveland Radio Engineer. We claim this to be the most efficient type of Variometer on the market today.

CALIBRATION CURVES furnished with every instrument.

"73" Variometer, "Huradio" winding as above, with knob and dial	$ 7.00
"73" Variometer, "Huradio" winding as above, without knob and dial	6.50
Set of three, two variometers and one variocoupler	19.00
Same without knobs and dials	17.25

We also manufacture Variometers with **one-piece moulded** stators and wooden rotors, wound to **standard** specifications. These are known as our "73" Variometers, type "A" windings and are the same price as "Huradio." "73" Variocouplers at same price as variometers.

We also make the "73" single blade Antenna Switch.

IMMEDIATE DELIVERY—DEALERS WRITE

Order the new "Radiotron" "U V 200" Tubes from us.

RADIOLECTRIC SHOP Dept. W., 919 Huron Road, Cleveland, Ohio

Write For Remler Bulletins

No. 1001-1002. Full description and prices on Radio Apparatus that

RADIATES QUALITY

Remler Radio Mfg. Company

E. T. Cunningham, Sales Mgr.

163 Sutter Street, San Francisco

TELEGRAPHY

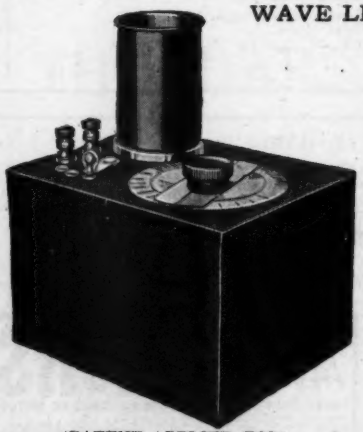
(Both Morse and Wireless) and RAILWAY ACCOUNTING taught thoroughly and quickly. Big salaries now paid. Great opportunities for advancement. Oldest and largest school; established 46 years. Endorsed by Telegraph, Railway, Radio, and Government officials. Expenses low—opportunities to earn large portion. Catalog free.

DODGE'S INSTITUTE E Street, Valparaiso, Ind.

THE

Doolittle Decremeter

WAVE LENGTH DECREMENT



(PATENT APPLIED FOR)

The Wavemeter is the Yard Stick of the Radio Art. In tuning up a Spark or C. W. set, and in countless laboratory experiments it is the ultimate source of reference. But the Wavemeter does not tell the whole story because it does not measure the Logarithmic Decrement, the factor which tells whether the energy radiated by your set is concentrated in a single sharp wave of great intensity or spread over a broad band of wave-lengths where it causes QRM and reduces your range.

The Doolittle Decremeter is both a superior Wavemeter and a Decremeter. The Wave-Length and Decrement can be obtained simultaneously, without complicated calculations. The range is 130-300 meters. Bakelite panel and insulation are used exclusively. An ideal instrument for Radio Clubs as well as individuals.

Price - - - - - $25.00

SEND FOR BULLETIN 107R DESCRIBING THIS INSTRUMENT

F. M. DOOLITTLE CO.

817 CHAPEL STREET NEW HAVEN, CONN.

Didn't You Know?

WE supposed everybody knew that any apparatus ordered from Corwin Mail Order Service was *guaranteed*,—to be shipped at once,—to arrive in perfect condition,—and to give complete satisfaction.

If you didn't know that, now go ahead and order from Corwin with perfect confidence.

NEW RADISCO COUPLER

The vario-coupler that's "accurate to the .002 part of an inch"! Moulded base, Formica tube, Brass for all metal parts. *Price* $7.50 *postpaid.*

Universal Coil-Mounting Plugs

Anyone can easily make smooth-running mountings with these plugs. Exceedingly accurate! Made to fit Radisco and all hand wound coils. *Price*, 80c *postpaid.*

VACUUM TUBES	
Electron Relay	$6.00
VT Amplifier, 1 lb.	7.00
VT Extra Hard	7.50
VARIABLE CONDENSERS	
A. R. Co. .001	$6.25
A. R. Co. .0005	5.00
With No. 67 Dial add $1.00	
Murdock 366	$4.75
Murdock 367	4.75
Murdock 368	3.75
Clapp-Eastham 800	7.50
Clapp-Eastham 800A	9.50
Clapp-Eastham 800B	11.50
Complete with dial	
Shipping weight One Pound.	
GRID CONDENSERS	
Radisco, Postage 3 cents	35c
ANTENNA SWITCHES	
Murdock, 3 lbs.	$4.50
Clapp-Eastham, 10 lbs.	12.50
OSCILLATION TRANSFORMERS	
Murdock No. 424 (5 lbs.)	$5.00
RADIO CRAFT PRODUCTS	
Detector	$15.00
Two step Amplifier	50.00
Detector and 1 step	45.00
Detector and 2 step	70.00
Postage paid.	
"B" BATTERIES	
Radisco No. 1. 2 lbs.	$1.50
Radisco No. 5. 5 lbs.	2.65
Everready Storage battery prices on application.	
TUSKA C. W. APPARATUS	
181 Coil, 2 lbs.	$ 7.50
182 Coil, 2 lbs.	10.00
183 Coil, 3 lbs.	12.50
170 Filt, 9 lbs.	16.00
AMPLIFYING TRANSFORMERS	
A. R. Co., 1 lb.	$5.00
Federal, 1 lb.	7.00
JACKS AND PLUGS	
Federal Closed Circuit	85c
Federal Open Circuit	70c
Federal Double Circuit	$1.00
Federal Plug	2.00
Pospaid.	
ALL RADISCO COILS and Wireless Press Books.	
ROTARY SWITCHES	
Clapp-Eastham, No. 19	$1.00
Clapp-Eastham, No. 19A	.85
Our Own, No. 1	.40
Our Own, No. 2	.85
Postage	.05
CORWIN DIALS	
No. 66, 3"	$ .75
No. 67, 3" with knob	1.30
No. 68, 3⅞"	1.00
No. 69, 3⅞" with knob	1.70
Postpaid.	
RECEIVERS	
Murdock, No. 55, 2000 ohm	$4.50
Murdock, No. 55, 3000 ohm	5.50
Brandes Superior	7.00
Baldwin C	16.50
Baldwin E, improved	20.00
Brownlie, New	12.50
Shipping weight 2 Pounds	
CONTACT POINTS	
CP-No. 1 Brass, dozen	25c
CP-4 Brass, dozen	35c
CP-5, Nickel Plated, dozen	45c
Postpaid.	
VARIOMETERS	
Radisco No. 1	$7.00
Radisco No. 1D	8.50
3 pounds.	

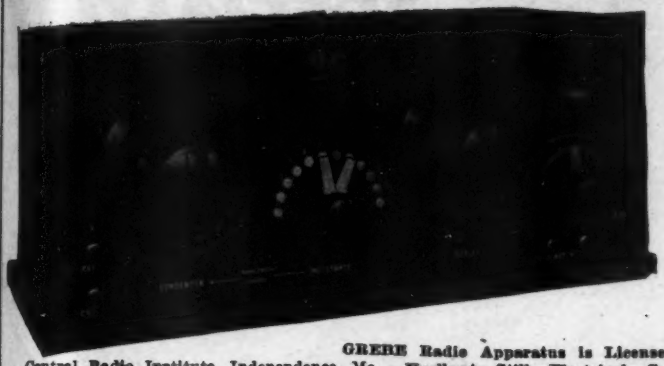
All orders for apparatus not listed as postpaid must be accompanied by postage charges.

A. H. CORWIN & COMPANY

Dept. C3. 4 West Park St.,

NEWARK. N. J.

Another Grebe Triumph!



150-3000 METERS.

After much experimental work, we have succeeded in adopting the Armstrong Regenerative circuit to a receiver having a wave-length range of 150-3,000 meters. The result is the

GREBE RADIO

Type CR-5 Regenerative Receiver

This is a complete receiver. The only additional equipment needed are phones, batteries and a detector tube.

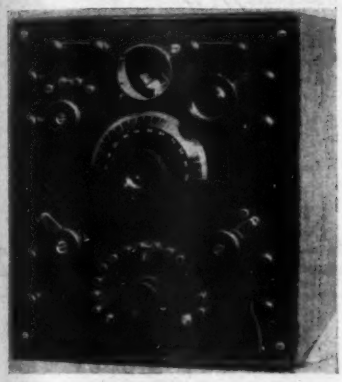
Included in its range are amateur, navy and commercial wave-lengths, special land stations, ship CW stations, navy low-wave arcs, all radio phone work and "Time." In operation, it is the last word in simplicity.

Ask to see it at your dealer's today.

GREBE Radio Apparatus is Licensed Under the Original Armstrong and Marconi Patents

Central Radio Institute, Independence, Mo.
Continental Radio and Electric Corp., New York.
Detroit Electric Co., Detroit, Mich.
Doubleday-Hill Electric Co., Pittsburgh, Pa.
Electrical Specialty Co., Columbus, Ohio.
Holt Electric Utilities Co., Jacksonville, Fla.
Hurlburt Still Electrical Co., Houston, Texas.
Kelly & Phillips, Brooklyn, N. Y.
The Newman-Stern Co., Cleveland, Ohio.
Klaus Radio Company, Eureka, Ill.
Manhattan Electrical Supply Co., New York, Chicago, St. Louis.
Leo J. Meyberg Co., San Francisco, Cal.
J. H. Bunnell & Co., New York City.
F. D. Pitts Co., Inc., Boston, Mass.
Philadelphia School of Wireless Telegraphy, Philadelphia, Pa.
Western Radio Electric Co., Los Angeles, Cal.

A. H. GREBE & CO., Inc., 78 Van Wyck Blvd., Richmond Hill, N. Y.



Model "J" 150-2500 Meters—Dimensions, 8 x 8 x9 inches; licensed under Marconi and Armstrong Patents.

$29.00

EFFICIENCY
COMPACTNESS

Model "J", JONES SHORT WAVE REGENERATIVE Receiver, is the last word in Modern radio. FORMICA Rotor and Stator tubes, and Panel, BAKELITE Dial. Primary Dead ended and Secondary made Variable. All waves—Damped—Continuous—Telephone from 150 to 2500 Meters. Our Bulletin tells the rest. Send for it.

Manufactured and Guaranteed by

The JONES RADIO CO., 384 Monroe St., Brooklyn, N. Y.

Cut and Mail today

"The Best Radio School in the East"

East Side Y. M. C. A. Radio School,
153 East 86th Street, New York City.

Gentlemen:

Kindly mail your Radio Booklet, also special scholarship offer.

Name .....

Address .....

Are you an ex-service man? .....

FIRTH RADIO SPECIALTIES

More World's Records

On Feb. 11 and 12, 5XB (Agricultural and Mechanical College of Texas), with three 5-watt tubes successfully sent radio-phone messages to 2ZL (J. O. Smith, Valley Stream, L. I.

As usual, Baldwin phones were on hand to bring in the signals, strong, clear, and true. Once more, Baldys demonstrated supersensitive action of their genuine mica diaphragm and amplifying mechanism.

Original Type "C"	**$16.50**
Improved Type "E"	**20.00**
New Type "F"	**21.00**

Eldredge Meters

Individually engraved and hand-calibrated. Famous for 25 years for their *unvarying* accuracy.

Hot Wire Ammeters (Model shown) AC and DC. Ranges up to 0-5 amps. Price $7.00

Advance "Midget" Ammeters and Voltmeters; 12 ranges, AC and DC. Price $8.00

Model S-D Ammeters and Voltmeters: Specially designed for 60 cycle circuits. Voltmeters, $10.00; Ammeters, $9.50

Brownlie Phones

Unquestionably the most sensitive metal-diaphragm phones in existence. *Instantly* adjustable to changes in signal strength and pitch. You not only match the units with each other, but actually with the desired signal. Rugged, light weight, equipped with Baldwin self-adjusting comfortable headbands.

One model, Price $12.50 complete.

If your dealer lacks a supply of folders, describing any of these Firth Specialties, write, mentioning his name, to

John Firth and Company, 18 Broadway, New York

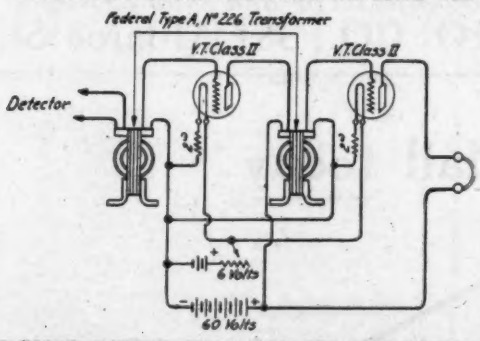
Federal Radio Accessories and Parts

No. 226-W Type A

AUDIO FREQUENCY Transformer **$7.50 each**

Are Distinguished for Their Reliability, Quality and Efficiency

WRITE FOR BULLETIN 101 AND 102



CIRCUIT WITH TWO STAGE AMPLIFIER

No. 52-W 2200 Ohms

LIBERTY HEAD SET **$12.50 per set**

One 226-W Transformer with one Marconi V. T. gives an energy amplification of 400 times. (Audibility amplification of 20 times.)

Two 226-W Transformers with two Marconi V. T.'s give an energy amplification of 160,000 times. (Audibility amplification of 400 times.)

The 226-W Transformer is endorsed by the leading engineers and conceded to be the best transformer on the market.

Federal Telegraph and Telephone Co.

Buffalo, New York

RADIO INSTITUTE OF AMERICA

(FORMERLY MARCONI INSTITUTE)

98 Worth Street, New York City (Third Floor) Telephone Franklin 6245

AMERICA'S FOREMOST SCHOOL
for Instruction in
Radio Telegraphy

Our Instruction Covers the Entire Radio Field
Our Graduates Cover the Entire World

PRACTICAL TRAINING QUICKEST RESULTS SMALLEST COST

Afternoon and Evening Classes Throughout the Year. Prospectus Mailed on Request. Address all Inquiries to Director

Branch School

New Call Building, New Montgomery St., San Francisco, Cal.

FISCHER SWEENY SERVICE CASTINGS QUALITY BRONZE COMPANY

Quick Service
Fine Quality

Bronze and Aluminum
Castings of the Better Grade

Our facilities enable us to make prompt shipments of quality castings in large quantities at attractive prices.

Castings guaranteed true to pattern.

Let us quote on your requirements.

Bronze Rods and Bushing Castings

Fisher-Sweeny Bronze Company
HOBOKEN, NEW JERSEY

A RADIOTRON DID IT!

3000 miles with a Radiotron U.V.200

What this amateur did you can duplicate providing you use one of these famous Radiotron detectors.

Radiotrons are reasonably priced and highly sensitive vacuum tubes of uniform characteristics. They are a product of the Research Laboratories of the General Electric Co.

The Radio Corporation's tubes are covered by patents dated November 7th, 1905, January 15th, 1907, and February 18th, 1908, as well as by other patents issued and pending. Tubes licensed for amateur and experimental use only. Any other use will constitute an infringement.

See your nearest dealer or write direct to

SALES DIVISION, COMMERCIAL DEPARTMENT, Suite 1801

Radio Corporation of America

WORLD WIDE WIRELESS

233 BROADWAY — NEW YORK CITY

BAKELITE-DILECTO

Manufacturers!

Wireless apparatus for commercial, experimental and amateur use has recently moved a considerable number of notches ahead.

Yesterday's Construction Doesn't Go Today

Handsome appearance must be combined with efficient working. The true enthusiast looks for both in the apparatus he buys nowadays.

This is particularly true of the insulation used. And the engineers and amateurs of widest experience have learned that when genuine

BAKELITE - DILECTO

is used, SATISFACTION is **SURE.**

Combine the popularity of this wonderful insulation with the best work you can do. Tell your customers that you use the genuine **BAKELITE-DILECTO**—and watch your sales grow.

BAKELITE-DILECTO WILL CUT YOUR MANUFACTURING COSTS—

because it comes in sheets, rods and tubes. This means the minimum of fitting work. It is waterproof, permanent and strong. We also manufacture **Vulcanized Fibre** and **Conite** for special insulating purposes.

Write us about your requirements. Our engineers will gladly show you how our products will solve your insulating problems.

THE CONTINENTAL FIBRE CO.

NEWARK, DELAWARE

233 Broadway, New York City.
525 Market St., San Francisco, Cal.
1710 Royal Bank Building,
Cor. King and Yonge Sts., Toronto, Ontario Canada.

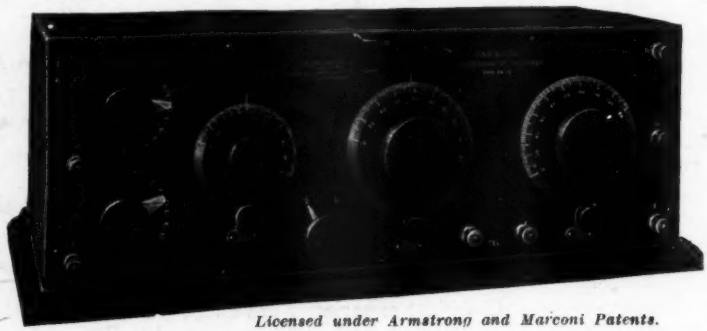
332 S. Michigan Ave., Chicago, Ill.
411 S. Main St., Los Angeles, Cal.
301 Fifth Ave., Pittsburgh, Pa.

CONTINENTAL NEWS

MAY, 1921

PUBLISHED EVERY MONTH IN WIRELESS AGE BY THE CONTINENTAL RADIO AND ELECTRIC CORPORATION

PARAGON RECEIVERS MAKE GOOD IN USER'S OWN TESTS



View of Paragon R.A.Ten Amplifying Short Wave Regenerative Receiver identical with the sets used in these tests

Licensed under Armstrong and Marconi Patents.

Prominent amateurs endorse Paragons after thorough tests and comparisons. "Comes up to all advertised requirements" says Y. M. C. A. Radio School

There are many genuine Paragon R. A. Ten Regenerative Receiving Sets now in actual use, more than fulfilling every advertised superiority. Mr. J. L. Hornung, of the Dep't of Education, East Side Y. M. C. A., writes:

Gentlemen:

We are in receipt of your Paragon R. A. Ten regenerative receiver and wish to extend a few words of appreciation.

The receiver has been given a due trial, in which *comparative* tests have been made with the best types of regenerative receivers now on the market. We find that it comes up to all of the specified requirements made in your advertisements *without any contradictions whatever!*

Very truly Yours,
Y. M. C. A. RADIO SCHOOL,
By *J. L. Hornung.*

"Heard stations never heard before."

A recent advertisement for Paragons carried the headline, "You'll hear stations you never heard before." In this connection this letter from J. Edw. Brown is interesting.

Glenbrook, Conn.

Gentlemen:

I thought it may be of interest to you to know about the Paragon R. A. Ten Receiver just installed a short time ago.

I hooked this up on the evening of Jan. 6. The first thing picked up was *Wisconsin.* From that time on we "heard stations that had never been heard before" in this section.

I picked up the steamer Gloucester (KQG) off Barnegat, talking to Asbury Park, *on detector alone,* as the first stage amplifier was uncomfortable for the ears.

Another surprise was that the instrument seems to be protected, as I failed to get any body capacity whatever!

This is the best by far that I have ever heard,—especially for strength of signals on detector alone.

I congratulate you on having such a wonderful machine,—and at the price of $85.00,—for at this amount it places the instrument within the reach of most amateurs.

Very truly,
J. EDW. BROWN.

Another amateur with a similar experience writes:

Bayshore, New York.

Gentlemen:

I have recently had the pleasure of trying out one of your Paragon R. A. Tens, and I am taking this time to congratulate you upon the design and construction of a tuner that, in my opinion, is the best thing that ever was placed on the market. Stations that, before the R. A.'s installation, were QRZ, or not heard at all, pounded in as though a two-step had been added to the set; and the tuning was sharp — much sharper than I had hitherto ever experienced.

There are two points that are especially to be commended: The ability to tune down to 150 meters with *no loss of amplification;* and the insensitiveness of the tuner to external capacity effects. These two points render it entirely possible to handle traffic by long jumps under the jam on 200 and up.

I trust that you may be interested in the results as enumerated, and in the points of superiority, over other tuners, that struck me forcibly.

Very truly yours,
TREMAINE HULSE.
2-B G R

The letters quoted here, as well as many others of similar nature, are on file at our office. Such wholehearted endorsement from experienced operators should guide you in your radio work. A Paragon Receiver may cost Eighty-five Dollars, to be sure—*But,* a genuine Paragon is never-theless the best "buy," per dollar, on the market. Remember, also, the guarantee is for *Two* Years. The instrument is built to long outlast the guarantee.

Order a Paragon R. A. Ten, or get our descriptive booklet by using the coupon below.

Outstanding features of the Genuine

PARAGON R A TEN

(Reg. U.S. Pat. Off.)

Amplifying Short Wave Receiver

Wave length, 160 to 1000 Meters. Amplification 100 times. No dead end losses whatever. Vernier attachments on all controls. Coupling has scale of 180°. Free from all body capacity effects. Guaranteed for two years. "The weaker the signal, the stronger the amplification."

Price, Eighty-five Dollars.

(COUPON)

Continental Radio and Electric Corp.,
Dept. E54, 6 Warren Street,
New York.

☐ Enclosed find remittance for Eighty-five Dollars. Ship me at once one Paragon R. A. Ten.

☐ Send me your free illustrated booklet, containing complete description of the Paragon R. A. Ten.

Name .....
Address .....
City ..... State.....

CONTINENTAL

RADIO AND ELECTRIC CORPORATION

J. DiBlasi, Sec. *J. Stantley, Treas.*

Dept. E54 6 Warren St. New York

MAIL ORDER SERVICE

The Continental Store New York has built up reputation for "extraordinary service at ordinary prices." The mail order department has earned a similar reputation and standing through its unvarying standards of Courtesy, Accuracy, Prompt... Send your next order to Continental, "Where the promise is performed." Please make remittance by P. O. Money Order or Bank Draft, to avoid any delay.

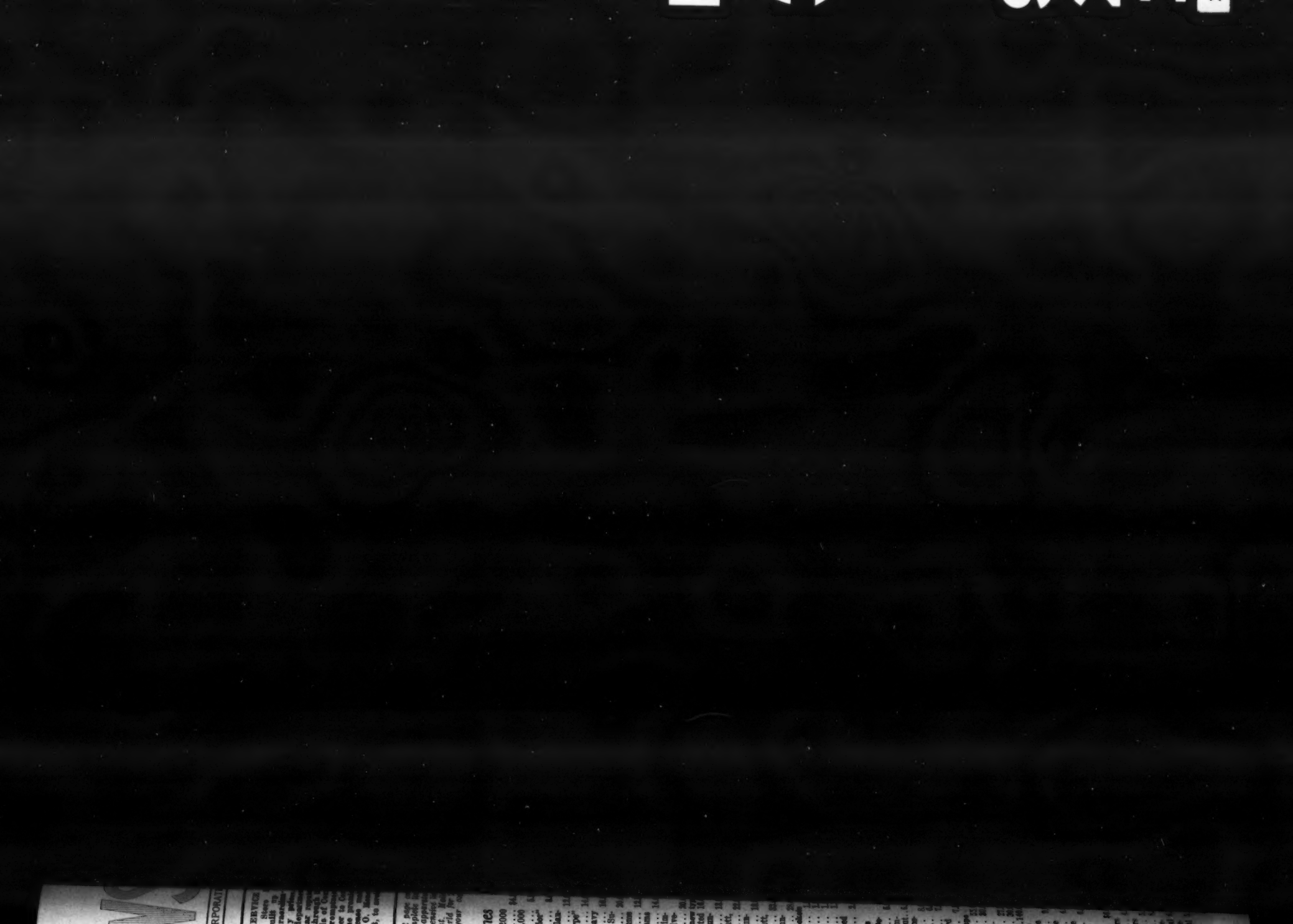
The Continental 112 page catalogue contains complete listings of all radio apparatus including a comprehensive list of C. W. equipment. Mailed anywhere in the world for 5 cents. Send for your copy today.

Telephones

No. 55 Murdocks, 2000 ohms	$4..
No. 55 Murdock 3,000 ohms	5..
Brandes "Superior" 2000 ohms	8..
Brandes "Trans-Atlantic" 2800 ohms	12..
Brandes "Navy Type" 3200 ohms	14..
Baldwins Type C Navy Standard	16..
Baldwins Type E Super-sensitive	20..
Century 2200 ohms (Govt. Standard)	12..
Century 3200 ohms (Govt. Standard)	14..
Brown 4000 ohms imported super-sensitive double armature	20..
Transformers (Acme new ty...	
Acme 250 Watt, mounted	14..
Acme 250 Watt, unmounted	12..
Acme 500 Watt, mounted	22..
Acme 500 Watt, unmounted	18..
Acme 1000 Watt, mounted	32..
Acme 1000 Watt, unmounted	28..
Vacuum Tube Sockets	
No. R-300 DeForest	1..
No. M-300 Marconi	1..
No. 55 Murdock	1..
No. 156 Gen. Radio	1..
No. R-400 Inverted Type	2..

Vacuum Tubes

Radiotron U. V. 200 Detector tube, just out	6..
Radiotron UV 201 Amplifying tube, just out	6..
Radiotron UV202, transmitter	8..
Electron relay	6..
Moorehead Amplifier	6..
Moorehead extra hard Transmitter	7..
Rotary Spark Gaps	
Bell Gaps in stock	25..
Benwood Gaps	30..
Benwood Gaps (Bakelite Case)	27..
Large Murdock Gap	30..
Grebe Synchronous Gap	140..
Line Protectors	
No. 379 Murdock line protector	8..
No. AM888 Dubilier line protector	4..
No. CD888 Dubilier line protector	8..

Variometers

Radio Craft Variometers	9..
Nightingale Variometers (small)	4..
Nightingale Variometers (large)	5..
Grebe Variometers	7..
Clapp-Eastham Variometer with knob and dial	8..
Clapp-Eastham Variometer, less knob and dial	6..